Diflubenzuron
Analysis of Risks
to
Endangered and Threatened Salmon and Steelhead

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Summary

Diflubenzuron is an insect growth regulator used to control a wide range of insects through inhibition of chitin formation. Target species include many leaf eating insects, such as grasshoppers, gypsy moth, forest tent caterpillar, Nantucket pine tip moth, velvet bean caterpillar, green cloverworm, beet armyworm, Mexican bean beetle, mosquito larvae, aquatic midge, rust mite, bollweevil, citrus root weevil, West Indian sugarcane rootstalk borer/weevil, sciarid fly and face fly.

It is a restricted use chemical that is currently registered for use on cotton, citrus, mushrooms, pastures, soybeans and ornamentals. It is also used in forestry, as a mosquito larvicide, and in cattle (mainly dairy cattle) to control manure flies. There are no registered residential uses for diflubenzuron. The Agency estimated in the 1997 Reregistration Eligibility Decision Document (RED) that <255,000 pounds of active ingredient are applied nationally on an annual basis. Soybeans and cotton were the largest use sites (approximately 30% each).

Registered formulations include the Technical Grade (97.5%) for manufacturing use, an intermediate compound (90%), and for end use, a soluble concentrate, flowable concentrate, wettable powder and a pelleted/tableted formulation. There were no adequate data to estimate the use of diflubenzuron on citrus, ornamentals, nuts, or in mosquito control programs.

Scope - Although this analysis is specific to listed western salmon and steelhead and the watersheds in which they occur, it is acknowledged that diflubenzuron is registered for uses that may occur outside this geographic scope and that additional analyses may be required to address other T&E species in the Pacific states as well as across the United States. I understand that any subsequent analyses, requests for consultation, and resulting Biological Opinions may necessitate that Biological Opinions relative to this request be revisited, and could be modified. Much of the quantitative information presented and used was derived from the Registration Eligibility Decision (RED) and the Ecological Risk Assessment (Attachment 1).

[1] **Comment: Data and the analysis based upon these data reflect information available at the time this report was completed. Additional data, which may have been submitted or changes in status after the submission date are not included in the author's evaluations, presentations, or comments.**

Contents

Attachments:

1. Background

Under section 7 of the Endangered Species Act, the Office of Pesticide Programs (OPP) of the U. S. Environmental Protection Agency (EPA) is required to consult on actions that 'may affect Federally listed endangered or threatened species or that may adversely modify designated critical habitat. Situations where a pesticide may affect a fish, such as any of the salmonid species listed by the National Marine Fisheries Service (NMFS), include either direct or indirect effects on the fish. Direct effects result from exposure to a pesticide at levels that may cause harm.

Acute Toxicity - Relevant acute data are derived from standardized toxicity tests with lethality as the primary endpoint. These tests are conducted with what is generally accepted as the most sensitive life stage of fish, i.e., very young fish from 0.5-5 grams in weight, and with species that are usually among the most sensitive. These tests for pesticide registration include analysis of observable sublethal effects as well. The intent of acute tests is to statistically derive a median effect level; typically the effect is lethality in fish (LC50) or immobility in aquatic invertebrates (EC50). Typically, a standard fish acute test will include concentrations that cause no mortality, and often no observable sublethal effects, as well as concentrations that would cause 100%

mortality. By looking at the effects at various test concentrations, a dose-response curve can be derived, and one can statistically predict the effects likely to occur at various pesticide concentrations; a well done test can even be extrapolated, with caution, to concentrations below those tested (or above the test concentrations if the highest concentration did not produce 100% mortality).

OPP typically uses qualitative descriptors to describe different levels of acute toxicity, the most likely kind of effect of modern pesticides (Table 1). These are widely used for comparative purposes, but must be associated with exposure before any conclusions can be drawn with respect to risk. Pesticides that are considered highly toxic or very highly toxic are required to have a label statement indicating that level of toxicity. The FIFRA regulations [40CFR158.490(a)] do not require calculating a specific LC50 or EC50 for pesticides that are practically non-toxic; the LC50 or EC50 would simply be expressed as >100 ppm. When no lethal or sublethal effects are observed at 100 ppm, OPP considers the pesticide will have "no effect" on the species.

Table 1. Qualitative descriptors for categories of fish and aquatic invertebrate toxicity (from Zucker, 1985)

LC50 or EC50	Category description
< 0.1 ppm	Very highly toxic
0.1- 1 ppm	Highly toxic
>1 < 10 ppm	Moderately toxic
> 10 < 100 ppm	Slightly toxic
> 100 ppm	Practically non-toxic

Comparative toxicology has demonstrated that various species of scaled fish generally have equivalent sensitivity, within an order of magnitude, to other species of scaled fish tested under the same conditions. Exceptions are known to occur for only an occasional pesticide, as based on the several dozen fish species that have been frequently tested. Sappington et al. (2001), Beyers et al. (1994) and Dwyer et al. (1999), among others, have shown that endangered and threatened fish tested to date are similarly sensitive, on an acute basis, to a variety of pesticides and other chemicals as are their non-endangered counterparts.

Chronic Toxicity - OPP evaluates the potential chronic effects of a pesticide on the basis of several types of tests. These tests are often required for registration, but not always. If a pesticide has essentially no acute toxicity at relevant concentrations, or if it degrades very rapidly in water, or if the nature of the use is such that the pesticide will not reach water, then chronic fish tests may not be required [40CFR158.490]. Chronic fish tests primarily evaluate the potential for reproductive effects and effects on the offspring. Other observed sublethal effects are also required to be reported. An abbreviated chronic test, the fish early-life stage test, is usually the first chronic test conducted and will indicate the likelihood of reproductive or chronic effects at relevant concentrations. If such effects are found, then a full fish life-cycle test will be conducted. If the nature of the chemical is such that reproductive effects are expected, the abbreviated test may be skipped in favor of the full life-cycle test. These chronic tests are designed to determine a "no observable effect level" (NOEL) and a "lowest observable effect level" (LOEL). A chronic risk requires not only chronic toxicity, but also chronic exposure, which can result from a chemical being persistent and resident in an environment (e.g., a pond) for a chronic period of time or from repeated applications that transport into any environment such that exposure would be considered "chronic".

As with comparative toxicology efforts relative to sensitivity for acute effects, EPA, in conjunction with the U. S. Geological Survey, has a current effort to assess the comparative toxicology for chronic effects also. Preliminary information indicates, as with the acute data, that endangered and threatened fish are again of similar sensitivity to similar non-endangered species.

Metabolites and Degradates - Information must be reported to OPP regarding any pesticide metabolites or Degradates that may pose a toxicological risk or that may persist in the environment [40CFR159.179]. Toxicity and/or persistence test data on such compounds may be required if, during the risk assessment, the nature of the metabolite or degradate and the amount that may occur in the environment raises a concern. If actual data or structure-activity analyses are not available, the requirement for testing is based upon best professional judgement.

Inert Ingredients - OPP does take into account the potential effects of what used to be termed "inert" ingredients, but which are beginning to be referred to as "other ingredients". OPP has classified these ingredients into several categories. A few of these, such as nonylphenol, can no longer be used without including them on the label with a specific statement indicating the potential toxicity. Based upon our internal databases, I can find no product in which nonylphenol is now an ingredient. Many others, including such ingredients as clay, soybean oil, many polymers, and chlorophyll, have been evaluated through structure-activity analysis or data and determined to be of minimal or no toxicity. There exist also two additional lists, one for inerts with potential toxicity which are considered a testing priority, and one for inerts unlikely to be toxic, but which cannot yet be said to have negligible toxicity. Any new inert ingredients are required to undergo testing unless it can be demonstrated that testing is unnecessary.

The inerts efforts in OPP are oriented only towards toxicity at the present time, rather than risk. It should be noted, however, that very many of the inerts are in exceedingly small amounts in pesticide products. While some surfactants, solvents, and other ingredients may be present in fairly large amounts in various products, many are present only to a minor extent. These include such things as coloring agents, fragrances, and even the printers ink on water soluble bags of pesticides. Some of these could have moderate toxicity, yet still be of no consequence because of the negligible amounts present in a product. If a product contains inert ingredients in sufficient quantity to be of concern, relative to the toxicity of the active ingredient, OPP attempts to evaluate the potential effects of these inerts through data or structure-activity analysis, where necessary.

For a number of major pesticide products, testing has been conducted on the formulated end-use products that are used by the applicator. The results of fish toxicity tests with formulated products can be compared with the results of tests on the same species with the active ingredient only. A comparison of the results should indicate comparable sensitivity, relative to the percentage of active ingredient in the technical versus formulated product, if there is no extra activity due to the combination of inert ingredients. I note that the "comparable" sensitivity must take into account the natural variation in toxicity tests, which is up to 2-fold for the same species in the same laboratory under the same conditions, and which can be somewhat higher between different laboratories, especially when different stocks of test fish are used.

The comparison of formulated product and technical ingredient test results may not provide specific information on the individual inert ingredients, but rather is like a "black box" which sums up the effects of all ingredients. I consider this approach to be more appropriate than testing each individual inert and active ingredient because it incorporates any additivity, antagonism, and synergism effects that may occur and which might not be correctly evaluated from tests on the individual ingredients. I do note, however, that we do not have aquatic data on most formulated products, although we often have testing on one or perhaps two formulations of an active ingredient.

Risk - An analysis of toxicity, whether acute or chronic, lethal or sublethal, must be combined with an analysis of how much will be in the water, to determine risks to fish. Risk is a combination of exposure and toxicity. Even a very highly toxic chemical will not pose a risk if there is no exposure, or very minimal exposure relative to the toxicity. OPP uses a variety of chemical fate and transport data to develop "estimated environmental concentrations" (EECs) from a suite of established models. The development of aquatic EECs is a tiered process.

The first tier screening model for EECs is with the GENEEC program, developed within OPP, which uses a generic site (in Yazoo, MS) to stand for any site in the U. S. The site choice was intended to yield a maximum exposure, or "worst-case," scenario applicable nationwide, particularly with respect to runoff. The model is based on a 10 hectare watershed that surrounds a one hectare pond, two meters deep. It is assumed that all of the 10 hectare area is treated with the pesticide and that any runoff would drain into the pond. The model also incorporates spray drift, the amount of which is dependent primarily upon the droplet size of the spray. OPP assumes that if this model indicates no concerns when compared with the appropriate toxicity data, then further analysis is not necessary as there would be no effect on the species.

It should be noted that prior to the development of the GENEEC model in 1995, a much more crude approach was used to determining EECs. Older reviews and Reregistration Eligibility Decisions (REDs) may use this approach, but it was excessively conservative and does not provide a sound basis for modern risk assessments. For the purposes of endangered species consultations, we will attempt to revise this old approach with the GENEEC model, where the old screening level raised risk concerns.

When there is a concern with the comparison of toxicity with the EECs identified in GENEEC model, a more sophisticated PRZM-EXAMS model is run to refine the EECs if a suitable scenario has been developed and validated. The PRZM-EXAMS model was developed with widespread collaboration and review by chemical fate and transport experts, soil scientists, and agronomists throughout academia, government, and industry, where it is in common use. As with the GENEEC model, the basic model remains as a 10 hectare field surrounding and draining into a 1 hectare pond. Crop scenarios have been developed by OPP for specific sites, and the model uses site-specific data on soils, climate (especially precipitation), and the crop or site. Typically, site-scenarios are developed to provide for a worst-case analysis for a particular crop in a particular geographic region. The development of site scenarios is very time consuming; scenarios have not yet been developed for a number of crops and locations. OPP attempts to match the crop(s) under consideration with the most appropriate scenario. For some of the older OPP analyses, a very limited number of scenarios were available. As more scenarios become available and are geographically appropriate to selected T&E species, older models used in previous analyses may be updated.

One area of significant weakness in modeling EECs relates to residential uses, especially by homeowners, but also to an extent by commercial applicators. There are no usage data in OPP that relate to pesticide use by homeowners on a geographic scale that would be appropriate for an assessment of risks to listed species. For example, we may know the maximum application rate for a lawn pesticide, but we do not know the size of the lawns, the proportion of the area in lawns, or the percentage of lawns that may be treated in a given geographic area. There is limited information on soil types, slopes, watering practices, and other aspects that relate to transport and fate of pesticides. We do know that some homeowners will attempt to control pests with chemicals and that others will not control pests at all or will use non-chemical methods. We would expect that in some areas, few homeowners will use pesticides, but in other areas, a high percentage could. As a result, OPP has insufficient information to develop a scenario or address the extent of pesticide use in a residential area.

It is, however, quite necessary to address the potential that home and garden pesticides may have to affect T&E species, even in the absence of reliable data. Therefore, I have developed a hypothetical scenario, by adapting an existing scenario, to address pesticide use on home lawns where it is most likely that residential pesticides will be used outdoors. It is exceedingly important to note that there is no quantitative, scientifically valid support for this modified scenario; rather it is based on my best professional judgement. I do note that the original scenario, based on golf course use, does have a sound technical basis, and the home lawn scenario is effectively the same as the golf course scenario. Three approaches will be used. First, the treatment of fairways, greens, and tees will represent situations where a high proportion of homeowners may use a pesticide. Second, I will use a 10% treatment to represent situations where only some homeowners may use a pesticide. Even if OPP cannot reliably determine the percentage of homeowners using a pesticide in a given area, this will provide two estimates. Third, where the risks from lawn use could exceed our criteria by only a modest amount, I can back-calculate the percentage of land that would need to be treated to exceed our criteria. If a smaller percentage is treated, this would then be below our criteria of concern. The percentage here would be not just of lawns, but of all of the treatable area under consideration; but in urban and highly populated suburban areas, it would be similar to a percentage of lawns. Should reliable data or other information become available, the approach will be altered appropriately.

It is also important to note that pesticides used in urban areas can be expected to transport considerable distances if they should run off on to concrete or asphalt, such as with streets (e.g., TDK Environmental, 2001). This makes any quantitative analysis very difficult to address aquatic exposure from home use. It also indicates that a no-use or no-spray buffer approach for protection, which we consider quite viable for agricultural areas, may not be particularly useful for urban areas.

Finally, the applicability of the overall EEC scenario, i.e., the 10 hectare watershed draining into a one hectare farm pond, may not be appropriate for a number of T&E species living in rivers or lakes. This scenario is intended to provide a "worst-case" assessment of EECs, but very many T&E fish do not live in ponds, and very many T&E fish do not have all of the habitat surrounding their environment treated with a pesticide. OPP does believe that the EECs from the farm pond model do represent first order streams, such as those in headwaters areas (Effland, et al. 1999). In many agricultural areas, those first order streams may be upstream from pesticide use, but in other areas, or for some non-agricultural uses such as forestry, the first order streams may receive pesticide runoff and drift. However, larger streams and lakes will very likely have lower, often considerably lower, concentrations of pesticides due to more dilution by the receiving waters. In addition, where persistence is a factor, streams will tend to carry pesticides away from where they enter into the streams, and the models do not allow for this. The variables in size of streams, rivers, and lakes, along with flow rates in the lotic waters and seasonal variation, are large enough to preclude the development of applicable models to represent the diversity of T&E species' habitats. We can simply qualitatively note that the farm pond model is expected to overestimate EECs in larger bodies of water.

Indirect Effects - We also attempt to protect listed species from indirect effects of pesticides. We note that there is often not a clear distinction between indirect effects on a listed species and adverse modification of critical habitat (discussed below). By considering indirect effects first, we can provide appropriate protection to listed species even where critical habitat has not been designated. In the case of fish, the indirect concerns are routinely assessed for food and cover.

The primary indirect effect of concern would be for the food source for listed fish. These are best represented by potential effects on aquatic invertebrates, although aquatic plants or plankton may be relevant food sources for some fish species. However, it is not necessary to protect individual organisms that serve as food for listed fish. Thus, our goal is to ensure that pesticides will not impair populations of these aquatic arthropods. In some cases, listed fish may feed on other fish. Because our criteria for protecting the listed fish species is based upon the most sensitive species of fish tested, then by protecting the listed fish species, we are also protecting the species used as prey.

In general, but with some exceptions, pesticides applied in terrestrial environments will not affect the plant material in the water that provides aquatic cover for listed fish. Application rates for herbicides are intended to be efficacious, but are not intended to be excessive. Because only a portion of the effective application rate of an herbicide applied to land will reach water through runoff or drift, the amount is very likely to be below effect levels for aquatic plants. Some of the applied herbicides will degrade through photolysis, hydrolysis, or other processes. In addition, terrestrial herbicide applications are efficacious in part, due to the fact that the product will tend to stay in contact with the foliage or the roots and/or germinating plant parts, when soil applied. With aquatic exposures resulting from terrestrial applications, the pesticide is not placed in immediate contact with the aquatic plant, but rather reaches the plant indirectly after entering the water and being diluted. Aquatic exposure is likely to be transient in flowing waters. However, because of the exceptions where terrestrially applied herbicides could have effects on aquatic plants, OPP does evaluate the sensitivity of aquatic macrophytes to these herbicides to determine if populations of aquatic macrophytes that would serve as cover for T&E fish would be affected.

For most pesticides applied to terrestrial environment, the effects in water, even lentic water, will be relatively transient. Therefore, it is only with very persistent pesticides that any effects would be expected to last into the year following their application. As a result, and excepting those very persistent pesticides, we would not expect that pesticidal modification of the food and cover aspects of critical habitat would be adverse beyond the year of application. Therefore, if a listed salmon or steelhead is not present during the year of application, there would be no concern. If the listed fish is present during the year of application, the effects on food and cover are considered as indirect effects on the fish, rather than as adverse modification of critical habitat.

Designated Critical Habitat - OPP is also required to consult if a pesticide may adversely modify designated critical habitat. In addition to the indirect effects on the fish, we consider that the use of pesticides on land could have such an effect on the critical habitat of aquatic species in a few circumstances. For example, use of herbicides in riparian areas could affect riparian vegetation, especially woody riparian vegetation, which possibly could be an indirect effect on a listed fish. However, there are very few pesticides that are registered for use on riparian vegetation, and the specific uses that may be of concern have to be analyzed on a pesticide by pesticide basis. In considering the general effects that could occur and that could be a problem for listed salmonids, the primary concern would be for the destruction of vegetation near the stream, particularly vegetation that provides cover or temperature control, or that contributes woody debris to the aquatic environment. Destruction of low growing herbaceous material would be a concern if that destruction resulted in excessive sediment loads getting into the stream, but such increased sediment loads are insignificant from cultivated fields relative to those resulting from the initial cultivation itself. Increased sediment loads from destruction of vegetation could be a concern in uncultivated areas. Any increased pesticide load as a result of destruction of terrestrial herbaceous vegetation would be considered a direct effect and would be addressed through the modeling of estimated environmental concentrations. Such modeling can and does take into account the presence and nature of riparian vegetation on pesticide transport to a body of water.

Risk Assessment Processes - All of our risk assessment procedures, toxicity test methods, and EEC models have been peer-reviewed by OPP's Science Advisory Panel. The data from toxicity tests and environmental fate and transport studies undergo a stringent review and validation process in accordance with "Standard Evaluation Procedures" published for each type of test. In addition, all test data on toxicity or environmental fate and transport are conducted in accordance with Good Laboratory Practice (GLP) regulations (40 CFR Part 160) at least since the GLPs were promulgated in 1989.

The risk assessment process is described in "Hazard Evaluation Division - Standard Evaluation Procedure - Ecological Risk Assessment" by Urban and Cook (1986) (termed Ecological Risk Assessment SEP below), which has been separately provided to National Marine Fisheries Service staff. Although certain aspects and procedures have been updated throughout the years, the basic process and criteria still apply. In a very brief summary: the toxicity information for various taxonomic groups of species is quantitatively compared with the potential exposure information from the different uses and application rates and methods. A risk quotient of toxicity divided by exposure is developed and compared with criteria of concern. The criteria of concern presented by Urban and Cook (1986) are presented in Table 2.

Table 2. Risk quotient criteria for direct and indirect effects on T&E fish

Test data	Risk quotient	Presumption
Acute LC50	>0.5	Potentially high acute risk
Acute LC50	>0.1	Risk that may be mitigated through restricted use classification
Acute LC50	>0.05	Endangered species may be affected acutely, including sublethal effects
Chronic NOEC	>1	Chronic risk; endangered species may be affected chronically, including reproduction and effects on progeny
Acute invertebrate LC50[a]	>0.5	May be indirect effects on T&E fish through food supply reduction
Aquatic plant acute EC50[a]	>1[b]	May be indirect effects on aquatic vegetative cover for T&E fish

a. Indirect effects criteria for T&E species are not in Urban and Cook (1986); they were developed subsequently.
b. This criterion has been changed from our earlier requests. The basis is to bring the endangered species criterion for indirect effects on aquatic plant populations in line with EFED's concern levels for these populations.

The Ecological Risk Assessment SEP (pages 2-6) discusses the quantitative estimates of how the acute toxicity data, in combination with the slope of the dose-response curve, can be used to predict the percentage mortality that would occur at the various risk quotients. The discussion indicates that using a "safety factor" of 10, as applies for restricted use classification, one individual in 30,000,000 exposed to the concentration would be likely to die. Using a "safety factor" of 20, as applies to aquatic T&E species, would exponentially increase the margin of safety. It has been calculated by one pesticide registrant (without sufficient information for OPP to validate that number), that the probability of mortality occurring when the LC50 is 1/20th of the EEC is 2.39×10^{-9}, or less than one individual in ten billion. It should be noted that the discussion (originally part of the 1975 regulations for FIFRA) is based upon slopes of primarily organochlorine pesticides, stated to be 4.5 probits per log cycle at that time. As organochlorine pesticides were phased out, OPP undertook an analysis of more current pesticides based on data reported by Johnson and Finley (1980), and determined that the "typical" slope for aquatic toxicity tests for the "more current" pesticides was 9.95. Because the slopes are based upon logarithmically transformed data, the probability of mortality for a pesticide with a 9.95 slope is again exponentially less than for the originally analyzed slope of 4.5.

The above discussion focuses on mortality from acute toxicity. OPP is concerned about other direct effects as well. For chronic and reproductive effects, our criteria ensures that the EEC is below the no-observed-effect-level, where the "effects" include any observable sublethal effects. Because our EEC values are based upon "worst-case" chemical fate and transport data and a small farm pond scenario, it is rare that a non-target organism would be exposed to such concentrations over a period of time, especially for fish that live in lakes or in streams (best professional judgement). Thus, there is no additional safety factor used for the no-observed-effect-concentration, in contrast to the acute data where a safety factor is warranted because the endpoints are a median probability rather than no effect.

Sublethal Effects - With respect to sublethal effects, Tucker and Leitzke (1979) did an extensive review of existing ecotoxicological data on pesticides. Among their findings was that sublethal effects as reported in the literature did not occur at concentrations below one-fourth to one-sixth of the lethal concentrations, when taking into account the same percentages or numbers affected, test system, duration, species, and other factors. This was termed the "6x hypothesis". Their review included cholinesterase inhibition, but was largely oriented towards externally observable parameters such as growth, food consumption, behavioral signs of intoxication, avoidance and repellency, and similar parameters. Even reproductive parameters fit into the hypothesis when the duration of the test was considered. This hypothesis supported the use of lethality tests for use in assessing acute ecotoxicological risk, and the lethality tests are well enough established and understood to provide strong statistical confidence, which can not always be achieved with sublethal effects. By providing an appropriate safety factor, the concentrations found in lethality tests can therefore generally be used to protect from sublethal effects. As discussed earlier, the entire focus of the early-life-stage and life-cycle chronic tests is on sublethal effects.

In recent years, Moore and Waring (1996) challenged Atlantic salmon with diazinon and observed effects on olfaction as relates to reproductive physiology and behavior. Their work indicated that diazinon could have sublethal effects of concern for salmon reproduction. However, the nature of their test system, direct exposure of olfactory rosettes, could not be quantitatively related to exposures in the natural environment. Subsequently, Scholz et al.

(2000) conducted a non-reproductive behavioral study using whole Chinook salmon in a model stream system that mimicked a natural exposure that is far more relevant to ecological risk assessment than the system used by Moore and Waring (1996). The Scholz et al. (2000) data indicate potential effects of diazinon on Chinook salmon behavior at very low levels, with statistically significant effects at nominal diazinon exposures of 1 ppb, with apparent, but non-significant effects at 0.1 ppb.

It would appear that the Scholz et al (2000) work contradicts the 6x hypothesis for acute effects. The research design, especially the nature and duration of exposure, of the test system used by Scholz et al (2000), along with a lack of dose-response, precludes comparisons with lethal levels in accordance with the 6x hypothesis as used by Tucker and Leitzke (1979). Nevertheless, it is known that olfaction is an exquisitely sensitive sense. And this sense may be particularly well developed in salmon, as would be consistent with its use by salmon in homing (Hasler and Scholz, 1983). So the contradiction of the 6x hypothesis is not surprising. As a result of these findings, the 6x hypothesis needs to be re-evaluated with respect to olfaction. At the same time, because of the sensitivity of olfaction and because the 6x hypothesis has generally stood the test of time otherwise, it would be premature to abandon the hypothesis for other acute sublethal effects until there are additional data.

2. Description of Diflubenzuron:

A. Chemical History: Diflubenzuron is an insecticide, first registered in the United States in 1979. A registration standard was issued in 1985 and a Data Call in was issued in 1991 for ecological effects. The current RED, issued in August 1997 reflects analysis of the new data.

B: Chemical Description:

- ❏ Common Name: diflubenzuron
- ❏ Chemical Name:
  N-[{(2-chlrophenyl)amino} carbonyl]-2-6-difluorobenzamide **OR**
  1-(4-chlorophenyl)-3-6-(2,6-diflurobenzoyl)urea
- ❏ Chemical Family: Urea derivative
- ❏ Case Number: 0144
- ❏ CAS Registry Number: 35367-38-5
- ❏ OPP Chemical Code: 108201
- ❏ Empirical Formula: $C_{14}H_9ClF_2N_2O_2$
- ❏ Molecular Weight: 310.7

- ❑ Trade and Other Names: Dimulin®, Vigilante®, Micromite®, Adept®

- ❑ Basic Manufacturer: Crompton/Uniroyal Chemical Company, Inc.

Diflubenzuron is a colorless to white, crystalline solid with a melting point of 210-230° C. Diflubenzuron is nearly insoluble in water (0.2 mg/L) but is soluble in organic solvents including acetonitile (2 g/L), acetone (6.5 g/L), dimethylsulfoxide and dimethylformamide (120 g/L) and N-methylpyrolidone (200 g/L)..

C. Chemical Use: The following is based on the currently registered uses of diflubenzuron:

- ❑ Type of Agent: Insecticide

- ❑ Classification: Restricted Use

- ❑ Summary of Sites:

    - Food/Feed Crops: cotton, citrus, cattle, rangeland, soybeans, mushrooms, peppers, nuts, cherries, and rice.

    - Other Agricultural Sites: Compost

    - Residential: None

    - Public Health: Mosquito larvicide, standing water (sewage systems)

    - Non-food Crops: Ornamentals and forestry (standing trees), ornamental ponds, and rangeland

    - Target Pests: Broad spectrum of insects including gypsy moth, forest tent caterpillar, Nantucket pine tip moth, velvet bean caterpillar, green cloverworm, beet armyworm, Mexican bean beetle, green cloverworm, mosquito larvae, aquatic midge, rust mite, bollweevil, citrus root weevil, West Indian sugarcane rootstalk borer/weevil, sciarid fly, and face fly

- ❑ Formulation Types Registered: Technical Grade/Manufacturing-Use Product (MUP), technical 95% a.i and a 90% formulation intermediate. End-use Product: 22% suspension concentrate, 25% wettable powder, 24% flowable, 9.7% bolus (for cattle), 40.4% liquid suspension, 80% granules, 0.10% solution (aquatic parasite control), and 0.25% bait stations (termite control stations)

❑ Method and Rate of Application:

- Equipment: Aircraft, hydraulic sprayer, air blast, bait stations, internal bolus (cattle).

- Method and Rate: Broadcast, ultra low volume spray, compost treatment, soil incorporation, cattle bolus, and prescription fish treatment for anchor worms (*Lernaea*) in ornamental ponds and aquariums. Maximum use rates range from a few grams/year to a maximum of 20 lbs a.i./A for mushrooms (enclosed facility).

- Timing: Diflubenzuron end-use products are applied variously. Multiple applications (2-8) are permitted for some crops and forest management, however maximum annual rates can not be exceeded.

D. Incidents: 14 reported incidents are in Agency files. One avian incident is included, with the remaining reports related to human exposure through use of the chemical. No evidence of fish kills are recorded.

E. Estimated and actual concentrations of diflubenzuron in water: An analysis of toxicity, whether acute or chronic, lethal or sublethal, must be combined with an analysis of how much chemical is estimated to be in receiving waters, to determine risks to fish. Risk is a combination of exposure and toxicity. Even a very highly toxic chemical will not pose a risk if there is no exposure, or very minimal exposure relative to the toxicity. OPP uses a variety of chemical fate and transport data to develop "estimated environmental concentrations" (EECs) from a suite of established models. The development of aquatic EECs is a tiered process.

As described previously, the first tier screening model for EECs is with the GENEEC program using a generic site (in Yazoo, MS) to stand for any site in the U. S. The site choice, based on a 10 hectare watershed that surrounds a one hectare pond, two meters deep, assumes that all of the 10 hectare area is treated with the pesticide and that any runoff would drain into the pond. This model probably has several drawbacks when applied to the subject of this review. Use data clearly indicates that pesticide treatment of 100% of the crop is rare, and application rates are commonly altered downward, to match the severity of the pest problem. An additional factor is the characteristics of the watersheds within the salmon and steelhead ESUs. Rather than a static pond, most are flowing streams and rivers and, in many cases, of considerable size and flow rates. This pattern is characteristic of Pacific salmon and steelhead, and where possible is included in the process of review and formation of opinions regarding the effects of diflubenzuron.

When there is a concern with the comparison of toxicity with the EECs identified in the GENEEC model, a more sophisticated PRZM-EXAMS model is run to refine the EECs if a suitable scenario has been developed and validated.

Use rates, derived from product labels, for calculating surface water EEC's, derived from Tier II PRZM-EXAMS model scenarios for diflubenzuron are listed below. Forest application data were derived assuming a direct application to water (streams, rivers, etc) based on direct application or dripping from trees.

Calculated Use Rates (annual) for **Diflubenzuron: Pounds Active Ingredient/Acre/year**

Citrus	0.9
Cherry	0.375
Christmas Trees	0.07
Cotton	0.4
Forest Trees	2.0
Mushroom (Compost)	20.0
Mosquito (Pasture)	0.2
Nuts	1.5
Ornamentals	0.25
Wide Area (Public Health)	0.06
Pears	1.0
Ornamental Ponds	0.7
Pepper	0.12
Rangeland	0.02
Rice	0.2
Stonefruit	0.5

Additional:

Cattle 0.01 lb a.i./animal (>550 lbs)

The results of this analysis are outlined in Table 3.

Table 3: EECs (in ppb) for diflubenzuron

Application Method	Peak GENEEC (ppb)	Average 4 day GENEEC	Average 21 day GENEEC	Average 60 day GENEEC	Average 90 day GENEEC
Ground or aerial non bearing citrus (PRIZM-EXAMS)	8.1	5.8	2.3	1.1	0.74
Cotton and bearing citrus (PRIZM-EXAMS)	4.1	3.4	1.9	1.1	0.87
(GENEEC) Forestry, direct application to water (0.02 lbs/A)	11.7	NA	NA	NA	NA

(GENEEC) Forestry, direct application to water {0.03 lbs/A)	22.8	NA	NA	NA	NA
(GENEEC) Forestry, direct application to water (0.06 lbs/A)	46.2	NA	NA	NA	NA
(GENEEC) Forestry, direct application to water (0.13 lbs/A)	91.8	NA	NA	NA	NA

Surface water monitoring data are limited on the actual distribution of diflubenzuron. The US Geological Survey National Water Quality Assessment program (NAWQA) indicates that diflubenzuron is not utilized extensively in the areas of concern for this review (Attachment 3).

F. Ecological Effects Toxicity Assessment:

i. Freshwater Fish: The minimum data required to establish the toxicity of diflubenzuron to freshwater fish is from two species. The preferred species are rainbow trout and bluegill sunfish. Results of these tests are shown in Table 4.

Table 4: Freshwater Fish, 96 Hour Acute Toxicity

Species	% a.i.	96-hour LC_{50} (ppm)	Toxicity Class
Oncorhynchus mykiss (rainbow trout)	97.9	140	practically non-toxic
Oncorhynchus mykiss (rainbow trout)	97.9	>100	practically non-toxic
Oncorhynchus mykiss (rainbow trout)	25% WP	240	practically non-toxic
Oncorhynchus mykiss (rainbow trout)	25% WP	340	practically non-toxic
Oncorhynchus mykiss (rainbow trout)	1% Granular	>1000	practically non-toxic
Lepomis macrochirus (bluegill sunfish)	97.9	135	practically non-toxic
Lepomis macrochirus (bluegill sunfish)	97.9	>100	practically non-toxic
Lepomis macrochirus (bluegill sunfish)	25% WP	>100	practically non-toxic

Lepomis macrochirus (bluegill sunfish)	25% WP	230	practically non-toxic
Lepomis macrochirus (bluegill sunfish)	1% Granular	>1000	practically non-toxic
Perca flavescens (yellow perch)	Technical	>25	slightly toxic
Salvelinas fontinalis (brook trout)	Technical	>50	slightly toxic
Pinephales promelias (Fathead minnow)	25% WP	>100	practically non-toxic
Ictalurus punctatus (channel catfish)	25% WP	>100	practically non-toxic
Cyprimus carpio (carp)	25 % WP	390	practically non-toxic
Onchorhycus clarki (cutthroat trout)	25% WP	57	slightly toxic

The 96-hour acute toxicity studies indicate that diflubenzuron is practically non-toxic to freshwater fish (1997 RED).

ii. Freshwater Fish, Chronic: A freshwater fish early life-cycle test was required for diflubenzuron. Results are shown in Table 5.

Table 5: Freshwater Fish Life Cycle Testing

Species	% a.i.	NOEL	LOEL	MATC	Endpoint
Pimephales promelas	99.4	0.10 ppm	>0.10 ppm	>0.10 ppm	None
Fundulus hetroclinus	97.6	0.05	NA	NA	None

These data indicate that diflubenzuron does not affect reproduction in freshwater fish (1997 RED).

iii. Freshwater Invertebrates, Acute: The preferred species for testing diflubenzuron toxicity in freshwater invertebrates is the waterflea. Results of acute toxicity tests are shown in Table 6:

Table 6: Acute Toxicity of diflubenzuron in Freshwater Invertebrates.

Species	% a.i.	48-hour LC_{50}/EC_{50} (ppb)	Toxicity Class
Daphnia magna (waterflea)	97.9	3.7	Very highly toxic
Daphnia magna (waterflea)	97.6	7.1	Very highly toxic
Daphnia magna (waterflea)	25	15	Very highly toxic
Daphnia magna (waterflea)	25	16	Very highly toxic
Gammerus pseudolimnaes (scud)	95	45 (96 hour)	Very highly toxic
Gammerus pseudolimnaes (scud)	95	30 (96 hour)	Very highly toxic
Gammerus pseudolimnaes (scud)	25	25 (96 hour)	Very highly toxic

Diflubenzuron is categorized as very highly toxic to freshwater invertebrates on an acute basis (1997 RED).

iv. Estuarine and Marine Organisms, Acute Toxicity: Toxicity testing of diflubenzuron in marine/estuarine organisms was required. Results of these tests are shown in Table 7.

Table 7: Acute Toxicity of Diflubenzuron in Marine/Estuarine Animals

Species	% a.i.	96 Hour LC_{50}/EC_{50}	Toxicity Class
Mysidopsis bahia (mysid)	99	2 ppb	Very highly toxic
Mysidopsis bahia (mysid)	95	2.1 ppb	Very highly toxic
Mercinaria mercinaria (quahog clam)	97.6	>0.32 ppm	Very highly toxic
Palamontes pugio (grass shrimp)	100	0.64 ppm	Very highly toxic
Fundulus heteroclitus (mummichog)	25 WP	255 ppm	practically non-toxic
Crassostrea virginica (eastern oyster)	25 WP	130 ppm	practically non-toxic
Mercinaria mercinaria (quahog clam)	25 WP	> 1000 ppm	practically non-toxic
Anodonta sp. (mussel)	25 WP	>1000 ppm	practically non-toxic
Uca pugilator (fiddler crab)	25 WP	>1000 ppm	practically non-toxic
Carcinus maenae (green crab)	25 WP	>1000 ppm	practically non-toxic

These data indicate that diflubenzuron is very highly toxic to marine/estuarine crustacea and to some mollusks, while practically non-toxic to other mollusks(1997 RED).

v. Aquatic Invertebrate Life-Cycle Testing

Testing of diflubenzuron in aquatic invertebrate life cycles was required. Results are shown in Table 8.

Table 8: Aquatic Invertebrate Early Life Cycle Toxicity

Species	% a.i.	NOEL	LOEL	Endpoint
Daphnia magna (waterflea)	99	<0.06 ppb	0.06 ppb	Reproduction/Survival
Daphnia magna (waterflea)	99	<0.09 ppb	0.09 ppb	Reproduction/Survival
Artemia salina (brine shrimp)	100	>10 ppb	>10 ppb	Reproduction
Mysidopsis bahia (mysid)	99	NA	0.075 ppb	Reproduction
Mysidopsis bahia (mysid)	97.6	45 ppt	86 ppt	Survival, growth, reproduction
Daphnia magna (waterflea)	97.6	40 ppt	93 ppt	Survival, growth, reproduction

These data indicate that diflubenzuron affects reproduction, growth, and survival in freshwater invertebrates as well as reproduction in marine/estuarine invertebrates (1997 RED).

G. Ecological Fate

Specific details on testing methods and results are presented in the 1997 RED for diflubenzuron (Attachment 1, pgs 55-62). The summary findings are that the chemical is relatively non-persistent and immobile. The major rate of dissipation appears to be biotically mediated processes. Field and laboratory studies indicated half-lives of 5.8 to 60 days. Calculated half-lives in California and Oregon orchards were, however, somewhat higher (68-78 days). Under aerobic conditions the major degradates are 4-chlorophenyl urea (CPU) and CO_2.

Diflubenzuron accumulates to low levels in fish tissue and depurates rapidly. Bioaccumulation rates for whole fish were reported as 78 to 360X, with a depuration of 99% at 14 days.

Though potential for aquatic contamination was noted, mainly through chemical adsorption to soil and through erosion. It was believed that this material would be mainly benthic.

In forestry applications residues of diflubenzuron did not persist in flowing water, ponds, sediment or soil.

H. Risk Quotients for Subject Species:

Based on toxicity and EEC data, risk quotients were calculated. The results of these calculations are presented in Table 9. Citrus was modeled in Florida and cotton in Mississippi, and the data my not be completely relevant to California and the Pacific Northwest due to differing soil and climate conditions.

Table 9: Risk Quotient Determinations for Freshwater Fish and Invertebrates

Site/Rate	Species	Acute RQ	Chronic RQ
Non-Bearing Citrus/0.67 lbs a.i./A	Bluegill Sunfish	<0.05	NA
Non-Bearing Citrus/0.67 lbs a.i./A	Rainbow Trout	<0.05	NA
Non-Bearing Citrus/0.67 lbs a.i./A	Fathead Minnow	<0.05	<1.0
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	Bluegill Sunfish	<0.05	NA
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	Rainbow Trout	<0.05	NA
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	Fathead Minnow	<0.05	<1.0
Forestry/0.016 lbs a.i./A	Bluegill Sunfish	<0.05	NA
Forestry/0.016 lbs a.i./A	Rainbow Trout	<0.05	NA
Forestry/0.016 lbs a.i./A	Fathead Minnow	<0.05	<1.0
Forest Trees and Forest Plantings/0.03 lbs a.i./A	Bluegill Sunfish	<0.05	NA

Forest Trees and Forest Plantings/0.03 lbs a.i./A	Rainbow Trout	<0.05	NA
Forest Trees and Forest Plantings/0.03 lbs a.i./A	Fathead Minnow	<0.05	<1.0
Forest Trees and Forest Plantings/0.06 lbs a.i./A	Bluegill Sunfish	<0.05	NA
Forest Trees and Forest Plantings/0.06 lbs a.i./A	Rainbow Trout	<0.05	NA
Forest Trees and Forest Plantings/0.06 lbs a.i./A	Fathead Minnow	<0.05	<1.0
Forest Trees and Forest Plantings/0.13 lbs a.i./A	Bluegill Sunfish	<0.05	NA
Forest Trees and Forest Plantings/0.13 lbs a.i./A	Rainbow Trout	<0.05	NA
Forest Trees and Forest Plantings/0.13 lbs a.i./A	Fathead Minnow	<0.05	<1.0

The results indicate the acute high risk, restricted use, and endangered species levels of concern are not exceeded for aquatic fish at the maximum application rates modeled at the time of the last (1997) RED preparation for sites with similar application rates and areas of use.

Marine/estuarine RQs were similarly determined and are shown in Table 10.

Table 10: Risk Quotient Determinations for Marine/Estuarine Organisms

Site/Rate	Species	Acute RQ	Chronic RQ
Non-Bearing Citrus/0.67 lbs a.i./A	*Mysidopsis bahia*	4	51
Non-Bearing Citrus/0.67 lbs a.i./A	*Mercinaria mercinaria*	<0.04	NA

Non-Bearing Citrus/0.67 lbs a.i./A	*Fundulus heteroclitus*	<0.05	<1
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	*Mysidopsis bahia*	2	41
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	*Mercinaria mercinaria*	<0.05	NA
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	*Fundulus heteroclitus*	<0.05	<1
Forestry/0.06 lbs a.i./A	*Mysidopsis bahia*	6	261
Forestry/0.06 lbs a.i./A	*Mercinaria mercinaria*	<0.05	
Forestry/0.06 lbs a.i./A	*Fundulus heteroclitus*	<0.05	<1
Forest Trees and Forest Plantings/0.03 lbs a.i./A	*Mysidopsis bahia*	12	506
Forest Trees and Forest Plantings/0.03 lbs a.i./A	*Mercinaria mercinaria*	<0.05	NA
Forest Trees and Forest Plantings/0.03 lbs a.i./A	*Fundulus heteroclitus*	<0.05	<1.0
Forest Trees and Forest Plantings/0.06 lbs a.i./A	*Mysidopsis bahia*	23	1028
Forest Trees and Forest Plantings/0.06 lbs a.i./A	*Mercinaria mercinaria*	0.14	NA
Forest Trees and Forest Plantings/0.06 lbs a.i./A	*Fundulus heteroclitus*	<0.05	<1.0

Forest Trees and Forest Plantings/0.13 lbs a.i./A	*Mysidopsis bahia*	47	2039
Forest Trees and Forest Plantings/0.13 lbs a.i./A	*Mercinaria mercinaria*	0.29	NA
Forest Trees and Forest Plantings/0.13 lbs a.i./A	*Fundulus heteroclitus*	<0.05	2

These results indicate that the endangered species, restricted use, and high risk is exceeded for forest, cotton, and citrus sites for *Mysidopsis*. Restricted use and endangered species risk levels are exceeded for *Mercinaria* for forestry application (1997 RED).

Risk Quotients were also determined for aquatic (freshwater) invertebrates. Results of these calculations are shown in Table 11.

Table 11: Risk Quotients for Diflubenzuron in Freshwater Invertebrates

Site	**Species**	**Acute RQ (96 hour)**	**Chronic RQ (21 day)**
Non-Bearing Citrus/0.67 lbs a.i./A	*Daphnia magna*	2.2	>38
Cotton/0.38 lb a.i./A and Bearing Citrus at 0.3215 lbs a.i./A	*Daphnia magna*	1.2	>31
Forestry/0.02 lbs a.i./A	*Daphnia magna*	3.2	>196
Forestry/0.03 lbs a.i./A	*Daphnia magna*	6.1	>396
Forestry/0.06 lbs a.i./A	*Daphnia magna*	12.5	>771
Forestry/0.13 lbs a.i./A	*Daphnia magna*	24.8	>1529

Endangered species, restricted use, and high acute risk levels were exceeded at all application sites for *Dapnia magna* (1997 RED).

I. Discussion and Characterization of Risk Assessment.

Diflubenzuron is a restricted use insecticide based on it's toxicity to aquatic invertebrates, used for the control of significant agricultural and public health related arthropod pests. These include mosquito abatement programs, gypsy moth control, and grasshopper (locust) infestations. In the RED, the Agency concluded there will be no direct adverse effects to fish from the use of diflubenzuron, however the risks to invertebrates are quite high.

The acute risk to fish is minimal, based on calculated RQs for both freshwater and marine/estuarine fish. There is some concern for the effects of diflubenzuron on invertebrates, due largely to its high toxicity as an arthropod growth regulator, the intended use of the product. This may have an indirect effect on T&E fish through the loss of food sources during the early phases of the life cycle. I anticipate, however, the rapid dilution expected and the onset of the highly mobile stages of the fish at or near the termination of yolk sac feeding will mitigate, to some degree, these effects. Previous studies have shown that there is some recovery, though not rapid, and repopulation of areas deliberately exposed to insecticide occurs. Dimilin is applied several times during a growing season. Areas with frequent knockdown may not recover.

I. Existing Protections: Row crops and orchards must include a 150 foot buffer zone for aerial application and a 25 foot vegetative buffer strip to decrease runoff. Warning information, listing this chemical as "Restricted Use" due to its potential effects on aquatic and marine invertebrates are specified. Warning statements include instructions not to apply to water or to areas where surface water is present, or to intertidal areas below the mean high tide mark. Spray drift precautions, including droplet size, boom length, and such factors as humidity, wind speed, and cautions about temperature inversions are incorporated in the label language.

K. Proposed Protections. The Agency has proposed no additional measures for the use of diflubenzueron due to its essentially non-toxic nature to birds, mammals, and fish.

3. Description of Pacific salmon and steelhead Evolutionarily Significant Units relative to diflubenzuron use sites.

The following review of diflubenzuron use in California and the Pacific Northwest is derived from several sources. California data is taken directly from the Department of Pesticide Regulation's published census and tabulation of actual chemical used. The tables for Idaho, Oregon, and Washington are constructed with the 1997 USDA Census of Agriculture as the basis for crops present in each state. The total acres planted was then modified following the estimated use factors included in the RED for diflubenzuron where possible, however many of the sites estimated are not common to California and the Pacific Northwest (Attachment 2). This is identified as the acres treated. For the northwest states, the amount of chemical applied is calculated on the basis of maximum application rates, identified in the RED and on product labels, applied to 100% of the potential acres. It is anticipated that this amount is an overestimate of actual use, however it represents the best available data at the time of review. In all counties if the reported or calculated level of pesticide use is less than 1 pound, they are listed as no use. The concern for cattle application is not considered significant. Application rates are small (0.01 lbs/>550 lbs/animal) and deposition to the environment is at a slow rate. Use of this product for treatment of ornamental and commercial ponds is also not considered because specific label guidelines prohibit release of treated water for several days after application. Forestry application is a concern because of potential direct application to water. Dimilin® is a recognized product for forestry in the Pacific Northwest, and therefore in this review it is considered that all forest zones are potential sites for diflubenzuron exposure, with the recognition that this is a significant overestimate of actual use.

Data are tabulated for rice, walnuts, outdoor ornamentals, artichokes, mushrooms, and public health in California. All available crops are included in reported data for Oregon, Washington, and Idaho. Forestry data for Oregon, Washington, and Idaho is derived from managed areas reported by the United States Department of Agriculture, Forestry Service (htpp://forestry.about.com/op/forest service) and presumes the conservative view that diflubenzuron will be applied. Direct consultation with the Washington Department of Agriculture (Barbara Moran, WA Department of Agriculture; Deborah Bahs, WA Endangered Species Program), however, indicated that this product is not applied in the Pacific Northwest and this is consistent with the use rates reported in California and data from the USGS surveys (attachment 4), where there is little reported use of the chemical in forestry operations. Label use guidelines, however, indicate that potential use could occur, and this is reflected in the opinions offered.

Some use of diflubenzuron, such as treatment for public health purposes and use in commercial fishery ponds, is also not available outside California and was not considered in this review.

<u>1. Southern California Steelhead ESU</u>

The Southern California steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This ESU ranges from the Santa Maria River in San Luis Obispo County south to San Mateo Creek in San Diego County. Steelhead from this ESU may also occur in Santa Barbara, Ventura and Los Angeles counties, but this ESU apparently is no longer considered to be extant in Orange County (65FR79328-79336, December 19, 2000). Hydrologic units in this ESU are Cuyama (upstream barrier - Vaquero Dam), Santa Maria, San Antonio, Santa Ynez (upstream barrier - Bradbury Dam), Santa Barbara Coastal, Ventura (upstream barriers - Casitas Dam, Robles Dam, Matilja Dam, Vern Freeman Diversion Dam), Santa Clara (upstream barrier - Santa Felicia Dam), Calleguas, and Santa Monica Bay (upstream barrier - Rindge Dam). Counties comprising this ESU show a very high percentage of declining and extinct populations.

River entry ranges from early November through June, with peaks in January and February. Spawning primarily begins in January and continues through early June, with peak spawning in February and March.

Within San Diego County, the San Mateo Creek runs through Camp Pendleton Marine Base and into the Cleveland National Forest. While there are agricultural uses of pesticides in other parts of California within the range of this ESU, it would appear that there are no such uses in the vicinity of San Mateo Creek. Within Los Angeles County, this steelhead occurs in Malibu Creek and possibly, but unlikely, To panga Creek. Neither of these creeks drain agricultural areas and there are no residential uses for this pesticide. There is a potential for steelhead in waters that drain agricultural areas in Ventura, Santa Barbara, and San Luis Obispo counties, but the small quantifies of diflubenzuron used make effects highly unlikely. Usage of diflubenzuron in counties where this ESU occurs are presented in Table 12.

Table 12. Counties supporting the Southern California steelhead ESU

County	Site	Acres Treated	lbs a.i. Applied
Los Angeles	Landscape	NR	7
Los Angeles	Public Health	NR	72
Los Angeles	Water Areas	17	4
San Diego	Outdr Plants	67	4
San Luis Obispo	Mushrooms	NR	18
Santa Barbara	Outdr Plants	NR	1
Santa Barbara	Strawberries	94	24
Ventura	Mushrooms	5	65
Ventura	Unknown	16	199

The very low amount of diflubenzuron used in the Southern California steelhead ESU and the absence of residential use, indicates that diflubenzuron will have no direct effect on the species of interest or indirect effects to its food sources.

2. South Central California Steelhead ESU

The South Central California steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final, as threatened, a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This coastal steelhead ESU occupies rivers from the Pajaro River, Santa Cruz County, to (but not including) the Santa Maria River, San Luis Obispo County. Most rivers in this ESU drain the Santa Lucia Mountain Range, the southernmost unit of the California Coast Ranges (62FR43937-43954, August 18, 1997). River entry ranges from late November through March, with spawning occurring from January through April.

This ESU includes the Hydrologic units of Pajaro (upstream barriers - Chesbro Reservoir, North Fork Pachero Reservoir), Estrella, Salinas (upstream barriers - Nacimiento Reservoir, Salinas Dam, San Antonio Reservoir), Central Coastal (upstream barriers - Lopez Dam, Whale Rock Reservoir), Alisa-Elkhorn Sloughs, and Carmel. Counties of occurrence include Santa Cruz, San Benito, Monterey, and San Luis Obispo. There are agricultural areas in these counties, and these areas would be drained by waters where steelhead critical habitat occurs.

Table 13: Counties supporting the South Central California steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Monterey	Artichoke	28956	3520
San Benito	Artichoke	59	2
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	NR	1
San Luis Obispo	Mushrooms	NR	18
Santa Clara	Mushrooms	NR	29
Santa Clara	Outdr Plants	15	2
Santa Clara	Structural Pest Cont.	NR	1
Santa Cruz	Artichoke	167	14

Use data indicates that less than 4,000 lbs of diflubenzuron is applied in the South Central California Steelhead ESU. Most of this application is in a single county (Monterey, 3,520 lbs) and because the ESU occupies a large geographic area and chemical use is minimal in most counties, a determination that diflubenzuron will not affect the species of concern is appropriate.

<u>3. Central California Coast Steelhead ESU</u>

The Central California coast steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final, as threatened, a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This coastal steelhead ESU occupies California river basins from the Russian River, Sonoma County, to Aptos Creek, Santa Cruz County, (inclusive), and the drainage of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), Napa County. The Sacramento-San Joaquin River Basin of the Central Valley of California is excluded. Steelhead in most tributary streams in San Francisco and San Pablo Bays appear to have been extirpated, whereas most coastal streams sampled in the central California coast region do contain steelhead.

Only winter steelhead are found in this ESU and those to the south. River entry ranges from October in the larger basins, late November in the smaller coastal basins, and continues through June. Steelhead spawning begins in November in the larger basins, December in the smaller coastal basins, and can continue through April with peak spawning generally in February and March. Hydrologic units in this ESU include Russian (upstream barriers - Coyote Dam, Warm Springs Dam), Bodega Bay, Suisun Bay, San Pablo Bay (upstream barriers - Phoenix Dam, San Pablo Dam), Coyote (upstream barriers - Almaden, Anderson, Calero, Guadelupe, Stevens Creek, and Vasona Reservoirs, Searsville Lake), San Francisco Bay (upstream barriers - Calveras Reservoir, Chabot Dam, Crystal Springs Reservoir, Del Valle Reservoir, San Antonio Reservoir), San Francisco Coastal South (upstream barrier - Pilarcitos Dam), and San Lorenzo-Soquel (upstream barrier - Newell Dam).

Counties of occurrence for this ESU are Santa Cruz, San Mateo, San Francisco, Marin, Sonoma, Mendocino, Napa, Alameda, Contra Costa, Solano, and Santa Clara counties. Usage of diflubenzuron in the counties where the Central California coast steelhead ESU is presented in Table 14.

Table 14: Counties supporting the Central California Coast steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Alameda			None
Contra Costa	Walnut	17	11
Marin			None
Mendocino			None
Napa			None
San Francisco			None
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	15	2
Santa Clara	Structural Pest Cont	NR	1
Santa Clara	Outdr Plants	NR	1
Santa Clara	Mushrooms	NR	29
Santa Cruz	Artichoke	157	14

Solano	Walnut	30	9
Sonoma			None

The low level of agricultural activity and the absence of residential uses indicates that no effects will be seen in the Central California Coast Steelhead ESU directly or indirectly.

4. California Central Valley Steelhead ESU

The California Central Valley steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final in 1998 (63FR 13347-13371, March 18, 1998). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes populations ranging from Shasta, Trinity, and Whiskeytown areas, along with other Sacramento River tributaries in the North, down the Central Valley along the San Joaquin River to and including the Merced River in the South, and then into San Pablo and San Francisco Bays. Counties at least partly within this area are Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Glenn, Marin, Merced, Nevada, Placer, Sacramento, San Francisco, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tuloumne, Yolo, and Yuba. A large proportion of this area is heavily agricultural. Usage of diflubenzuron in counties where the California Central Valley steelhead ESU occurs is presented in Table 15.

Table 15: Counties supporting the California Central Valley steelhead ESU.

County	Site	Acres Treated	lbs. a.i. Applied
Alameda			None
Amador			None
Butte	Rice	2435	312
Calaveras			None
Contra Costa	Walnut	17	11
Glenn	Rice	1087	124
Marin			None
Merced	Walnut	173	44
Nevada			None
Placer	Rice	727	94

Sacramento	Rice	289	32
San Joaquin	Public Health	NR	2
San Joaquin	Walnut	1842	492
San Francisco			None
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	NR	1
Shasta			None
Solano	Walnut	30	9
Sonoma			None
Stanislaus	Public Health	NR	4
Stanislaus	Walnut	221	56
Sutter	Public Health	NR	<10
Sutter	Rice	2395	293
Sutter	Walnut	78	19
Tehama			None
Tuolumne			None
Yolo			None
Yuba	Rice	1412	212

The California Central Valley Steelhead ESU is not subjected to heavy diflubenzuron application, particularly relative to the large area occupied by it. Use of diflubenzuron will have no effect on the species of concern directly or indirectly.

5. Northern California Steelhead ESU

The Northern California steelhead ESU was proposed for listing as threatened on February 11, 2000 (65FR6960-6975) and the listing was made final on June 7, 2000 (65FR36074-36094). Critical Habitat has not yet been officially established.

This Northern California coastal steelhead ESU occupies river basins from Redwood Creek in Humboldt County, CA to the Gualala River, inclusive, in Mendocino County, CA. River entry ranges from August through June and spawning from December through April, with peak spawning in January in the larger basins and in late February and March in the smaller coastal basins. The Northern California ESU has both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead, in the Middle Fork Eel River. Counties included appear to be Humboldt, Mendocino, Trinity, and Lake. Table 17 shows the use of diflubenzuron in the counties where the Northern California steelhead ESU occurs.

Table 16: Counties supporting the Northern California steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Humboldt			None
Lake			None
Mendocino			None
Trinity			None

The Northern California Steelhead ESU is not exposed to diflubenzuron use. There will be no effects on the species of concern.

6. Upper Columbia River steelhead ESU

The Upper Columbia River steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

The Upper Columbia River steelhead ESU ranges from several northern rivers close to the Canadian border in central Washington (Okanogan and Chelan counties) to the mouth of the Columbia River. The primary area for spawning and growth through the smolt stage of this ESU is from the Yakima River in south Central Washington upstream. Hydrologic units within the spawning and rearing habitat of the Upper Columbia River steelhead ESU and their upstream barriers are Chief Joseph (upstream barrier - Chief Joseph Dam), Okanogan, Similkameen, Methow, Upper Columbia-Entiat, Wenatchee, Moses-Coulee, and Upper Columbia-Priest Rapids. Within the spawning and rearing areas, counties are Chelan, Douglas, Okanogan, Grant, Benton, Franklin, Kittitas, and Yakima, all in Washington.

Areas downstream from the Yakima River are used for migration. Additional counties through which the ESU migrates are Walla Walla, Klickitat, Skamania, Clark, Columbia, Cowlitz, Wahkiakum, and Pacific, Washington; and Gilliam, Morrow, Sherman, Umatilla, Wasco, Hood River, Multnomah, Columbia, and Clatsop, Oregon.

Tables 17 and 18 show the cropping information and maximum potential diflubenzuron use for Washington counties where the Upper Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 17. Spawning and rearing areas supporting the Upper Columbia River steelhead ESU

State	County	Site	Acres Treated	lbs a.i. Applied
WA	Benton	Walnuts	41	33
WA	Benton	Outdr Plants	216	389
WA	Benton	Cherries	3219	1207
WA	Benton	Pears	472	472
WA	Franklin	Pears	156	156
WA	Franklin	Walnuts	5	8
WA	Franklin	Cherries	2165	812
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Mushrooms	7	140
WA	Grant	Walnuts	5	8
WA	Grant	Outdr Plants	6454	1614
WA	Grant	Cherries	3479	1305
WA	Grant	Pears	998	998
WA	Okanogan	Walnuts	29	23
WA	Okanogan	Christmas Trees	22	2
WA	Okanogan	Pears	3280	3280
WA	Okanogan	Forest	1499171	2998342
WA	Okanogan	Cherries	1003	376
WA	Okanogan	Outdr Plants	111	200
WA	Yakima	Peppers	439	165
WA	Yakima	Filberts	6	2

WA	Yakima	Walnuts	11	3
WA	Yakima	Outdr Plants	821	205
WA	Yakima	Cherries	8129	3048
WA	Yakima	Forest	517340	1034600
WA	Yakima	Pears	10190	10190

Table 18: Oregon and Washington counties that are migration corridors for the Upper Columbia River steelhead ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop	Outdr Plants	82	13
OR	Clatsop	Christmas Trees	25	2
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Gilliam			None
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Morrow	Forest	143305	286618
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734

OR	Multnomah	Forest	77826	155652
OR	Sherman	Outdr Plants	113	28
OR	Umatilla	Cherries	349	131
OR	Umatilla	Pears	4	4
OR	Umatilla	Outdr Plants	396	99
OR	Umatilla	Forest	401714	803428
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75
WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Klickitat	Forest	34537	69074
WA	Klickitat	Cherries	457	171
WA	Klickitat	Pears	331	331
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3

WA	Wahkiakum			None
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Outdr Plants	2714	4885

The Upper Columbia River Steelhead ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

7. Snake River Basin steelhead ESU

The Snake River Basin steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

Spawning and early growth areas of this ESU consist of all areas upstream from the confluence of the Snake River and the Columbia River as far as fish passage is possible. Hells Canyon Dam on the Snake River and Dworshak Dam on the Clearwater River, along with Napias Creek Falls near Salmon, Idaho, are named as impassable barriers. These areas include the counties of Wallowa, Baker, Union, and Umatilla (northeastern part) in Oregon; Asotin, Garfield, Columbia, Whitman, Franklin, and Walla Walla in Washington; and Adams, Idaho, Nez Perce, Blaine, Custer, Lemhi, Boise, Valley, Lewis, Clearwater, and Latah in Idaho. Baker County, Oregon, which has a tiny fragment of the Imnaha River watershed was excluded. While a small part of Rock Creek that extends into Baker County, this occurs at 7200 feet in the mountains (partly in a wilderness area) and is of no significance with respect to diflubenzuron use in agricultural areas. Similarly excluded are the Upper Grande Ronde watershed tributaries (e.g., Looking Glass and Cabin Creeks) that are barely into higher elevation forested areas of Umatilla County. However, crop areas of Umatilla County are considered in the migratory routes. In Idaho, Blaine and Boise counties technically have waters that are part of the steelhead ESU, but again, these are tiny areas which occur in the Sawtooth National Recreation Area and/or National Forest lands. They have been excluded because they are not relevant to use of diflubenzuron. The agricultural areas of Valley County, Idaho, appear to be primarily associated with the Payette River watershed, but there is enough of the Salmon River watershed in this county that it was not excluded.

Critical Habitat also includes the migratory corridors of the Columbia River from the confluence of the Snake River to the Pacific Ocean. Additional counties in the migratory corridors are Umatilla, Gilliam, Morrow, Sherman, Wasco, Hood River, Multnomah, Columbia, and Clatsop in Oregon; and Benton, Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific in Washington.

Tables 19 and 20 show the cropping information for the Pacific Northwest counties where the Snake River Basin steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 19: Rearing/spawning areas supporting the Snake River Basin steelhead ESU .

State	County	Site	Acres Treated	lbs a.i. Applied
ID	Adams	Forest	506136	1012272
ID	Adams	Outdr Plants	8	15
ID	Clearwater	Forest	801599	1603198
ID	Custer	Forest	2123718	4247428
ID	Idaho	Pears	2	2
ID	Idaho	Forest	4431562	8863124
ID	Idaho	Christmas Trees	20	1
ID	Latah	Forest	113187	226374
ID	Latah	Pears	2	2
ID	Latah	Christmas Trees	78	6
ID	Lemhi	Pears	2	2
ID	Nez Perce	Forest	50563	101126
ID	Valley	Forest	2037245	4074490
OR	Union	Forest	617313	1234626
OR	Wallowa	Forest	1149951	2299902
WA	Adams	Outdr Plants	1331	333
WA	Asotin	Forest	53797	107594
WA	Asotin	Cherries	17	6
WA	Asotin	Pears	6	6
WA	Columbia	Forest	53797	107594

WA	Franklin	Pears	156	156
WA	Franklin	Walnuts	5	8
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Cherries	2165	812
WA	Franklin	Mushrooms	7	140
WA	Garfield	Forest	476495	952990
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Outdr Plants	2714	4885

Table 20. Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop	Outdr Plants	82	13
OR	Clatsop	Christmas Trees	25	2
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Gilliam			None
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Morrow	Forest	143305	286618
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12

OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Sherman	Outdr Plants	113	28
OR	Umatilla	Cherries	349	131
OR	Umatilla	Pears	4	4
OR	Umatilla	Outdr Plants	396	99
OR	Umatilla	Forest	401714	803428
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
WA	Benton	Walnuts	41	33
WA	Benton	Outdr Plants	216	389
WA	Benton	Cherries	3219	1207
WA	Benton	Pears	472	472
WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75
WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Christmas Trees	16	1
WA	Cowletz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Klickitat	Forest	34537	69074

WA	Klickitat	Cherries	457	171
WA	Klickitat	Pears	331	331
WA	Wahkiakum			None
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885

The Snake River Basin Steelhead ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

8 Upper Willamette River steelhead ESU

The Upper Willamette River steelhead ESU was proposed for listing as threatened on March 10, 1998 (63FR11798-11809) and the listing was made final a year later (64FR14517-14528, March 25, 1999). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). Only naturally spawned, winter steelhead trout are included as part of this ESU; where distinguishable, summer-run steelhead trout are not included.

Spawning and rearing areas are river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls up through the Calapooia River. This includes most of Benton, Linn, Polk, Clackamas, Marion, Yamhill, and Washington counties, and small parts of Lincoln and Tillamook counties. However, the latter two counties are small portions in forested areas where diflubenzuron would not be used, and these counties are excluded from my analysis. While the Willamette River extends upstream into Lane County, the final Critical Habitat Notice does not include the Willamette River (mainstem, Coastal and Middle forks) in Lane County or the MacKenzie River and other tributaries in this county that were in the proposed Critical Habitat.

Hydrologic units where spawning and rearing occur are Upper Willamette, North Santiam (upstream barrier - Big Cliff Dam), South Santiam (upstream barrier - Green Peter Dam), Middle Willamette, Yamhill, Molalla-Pudding, and Tualatin.

The areas below Willamette Falls and downstream in the Columbia River are considered migration corridors, and include Multnomah, Columbia and Clatsop counties, Oregon, and Clark, Cowlitz, Wahkiakum, and Pacific counties, Washington.

Tables 21 and 22 show the cropping information for Oregon counties where the Upper Willamette River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 21: Spawning and rearing habitat of the Upper Willamette River steelhead ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Benton	Cherries	18	7
OR	Benton	Pears	7	7
OR	Benton	Filberts	493	740
OR	Benton	Walnuts	23	35
OR	Benton	Christmas Trees	1983	139
OR	Benton	Outdr Plants	6212	1553
OR	Benton	Peppers	5	2
OR	Linn	Peppers	2	1
OR	Linn	Cherries	157	59
OR	Linn	Pears	26	26
OR	Linn	Filberts	1820	2730
OR	Linn	Walnuts	55	83
OR	Linn	Outdr Plants	1563	391
OR	Linn	Christmas Trees	292	20
OR	Linn	Forest	464463	928926
OR	Polk	Forest	91448	182896
OR	Polk	Cherries	1888	708
OR	Polk	Pears	83	83

OR	Polk	Filberts	2394	3591
OR	Polk	Walnuts	33	50
OR	Polk	Christmas Trees	644	45
OR	Polk	Outdr Plants	6638	1660
OR	Clackamas	Cherries	53	20
OR	Clackamas	Peppers	29	11
OR	Clackamas	Pears	37	37
OR	Clackamas	Filberts	3994	5991
OR	Clackamas	Walnuts	51	77
OR	Clackamas	Outdr Plants	29217	7304
OR	Clackamas	Christmas Trees	7532	527
OR	Clackamas	Forest	382374	764748
OR	Marion	Peppers	33	12
OR	Marion	Cherries	1568	588
OR	Marion	Pears	150	150
OR	Marion	Filberts	7061	10592
OR	Marion	Walnuts	155	233
OR	Marion	Outdr Plants	21309	5327
OR	Marion	Christmas Trees	3712	260
OR	Marion	Forest	202970	405940
OR	Yamhill	Cherries	211	79
OR	Yamhill	Pears	54	54
OR	Yamhill	Filberts	7110	10665
OR	Yamhill	Walnuts	808	1212
OR	Yamhill	Outdr Plants	5590	1398
OR	Yamhill	Christmas Trees	556	39
OR	Yamhill	Forest	25423	50846

OR	Washington	Cherries	211	79
OR	Washington	Pears	69	69
OR	Washington	Filberts	5595	8393
OR	Washington	Walnuts	679	1019
OR	Washington	Outdr Plants	7538	1885
OR	Washington	Christmas Trees	1411	99
OR	Washington	Peppers	2	1

Table 22. Oregon and Washington counties that are part of the migration corridors of the Upper Willamette River steelhead ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Clatsop	Outdr Plants	82	13
OR	Clatsop	Christmas Trees	25	2
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
WA	Clark	Pears	75	75
WA	Clark	Forest	1183	2366
WA	Clark	Christmas Trees	358	25

WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Wahkiakum			None
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322

The Upper Willamette River Steelhead ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

9. Lower Columbia River steelhead ESU

The Lower Columbia River steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes all tributaries from the lower Willamette River (below Willamette Falls) to Hood River in Oregon, and from the Cowlitz River up to the Wind River in Washington. These tributaries would provide the spawning and presumably the growth areas for the young steelhead. It is not clear if the young and growing steelhead in the tributaries would use the nearby mainstem of the Columbia prior to downstream migration. If not, the spawning and rearing habitat would occur in the counties of Hood River, Clackamas, and Multnomah counties in Oregon, and Skamania, Clark, and Cowlitz counties in Washington. Tributaries of the extreme lower Columbia River, e.g., Grays River in Pacific and Wahkiakum counties, Washington and John Day River in Clatsop county, Oregon, are not discussed in the Critical Habitat FRNs; because they are not “between” the specified tributaries, they do not appear part of the spawning and rearing habitat for this steelhead ESU. The mainstem of the Columbia River from the mouth to Hood River constitutes the migration corridor. This would additionally include Columbia and Clatsop counties, Oregon, and Pacific and Wahkiakum counties, Washington.

Hydrologic units for this ESU are Middle Columbia-Hood, Lower Columbia-Sandy (upstream barrier - Bull Run Dam 2), Lewis (upstream barrier - Merlin Dam), Lower Columbia-Clatskanie, Lower Cowlitz, Lower Columbia, Clackamas, and Lower Willamette.

Tables 23 and 24 show the cropping information for Oregon and Washington counties where the Lower Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 23. Spawning/rearing areas for the Lower Columbia steelhead ESU

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clackamas	Cherries	53	20
OR	Clackamas	Peppers	29	11
OR	Clackamas	Pears	37	37
OR	Clackamas	Filberts	3994	5991
OR	Clackamas	Walnuts	51	77
OR	Clackamas	Outdr Plants	29217	7304
OR	Clackamas	Christmas Trees	7532	527
OR	Clackamas	Forest	382374	764748
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75

WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Outdr Plants	373	671
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3

Table 24: Migratory corridors for the Lower Columbia River Steelhead ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop			None
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Wahkiakum			None

The Lower Columbia River Steelhead ESU courses through major agricultural zones and large forest areas. In particular the potential chemical uasage in the spawning/rearing zones, where indirect effects may have the most effects, must be noted. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species appears most appropriate.

<u>10. Middle Columbia River Steelhead ESU</u>

The Middle Columbia River steelhead ESU was proposed for listing as threatened on March 10, 1998 (63FR11798-11809) and the listing was made final a year later (64FR14517-14528, March 25, 1999). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This steelhead ESU occupies "the Columbia River Basin and tributaries from above the Wind River in Washington and the Hood River in Oregon (exclusive), upstream to, and including, the Yakima River, in Washington." The Critical Habitat designation indicates the downstream boundary of the ESU to be Mosier Creek in Wasco County, Oregon; this is consistent with Hood River being "excluded" in the listing notice. No downstream boundary is listed for the Washington side of the Columbia River, but if Wind River is part of the Lower Columbia steelhead ESU, it appears that Collins Creek, Skamania County, Washington would be the last stream down river in the Middle Columbia River ESU. Dog Creek may also be part of the ESU, but White Salmon River certainly is, since the Condit Dam is mentioned as an upstream barrier. There is limited data on the status of the Dog and Collins creeks. The only other upstream barrier, in addition to Condit Dam on the White Salmon River is the Pelton Dam on the Deschutes River. As an upstream barrier, this dam would preclude steelhead from reaching the Metolius and Crooked Rivers as well the upper Deschutes River and its tributaries.

In the John Day River watershed, I have excluded Harney County, Oregon because there is only a tiny amount of the John Day River and several tributary creeks (e.g., Utley, Bear Cougar creeks) which get into high elevation areas (approximately 1700M and higher) of northern Harney County where there are no crops grown. Similarly, the Umatilla River and Walla Walla River get barely into Union County OR, and the Walla Walla River even gets into a tiny piece of Wallowa County, Oregon. But again, these are high elevation areas where crops are not grown, and are excluded counties for this analysis.

The Oregon counties then that appear to have spawning and rearing habitat are Gilliam, Morrow, Umatilla, Sherman, Wasco, Crook, Grant, Wheeler, and Jefferson counties. Hood River, Multnomah, Columbia, and Clatsop counties in Oregon provide migratory habitat. Washington counties providing spawning and rearing habitat would be Benton, Columbia, Franklin, Kittitas, Klickitat, Skamania, Walla Walla, and Yakima, although only a small portion of Franklin County between the Snake River and the Yakima River is included in this ESU. Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties in Washington provide migratory corridors.

Tables 25 and 26 show the cropping information for Oregon and Washington counties where the Middle Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 25. Spawning/Rearing areas for the Middle Columbia Steelhead ESU

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Crook	Outdr Plants	281	70
OR	Crook	Forest	434235	868470
OR	Gilliam			None
OR	Jefferson	Forest	278740	557480

OR	Morrow	Forest	143305	286618
OR	Sherman	Outdr Plants	113	28
OR	Umatilla	Cherries	349	131
OR	Umatilla	Pears	4	4
OR	Umatilla	Outdr Plants	396	99
OR	Umatilla	Forest	401714	803428
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
OR	Wheeler	Forest	169345	338698
WA	Benton	Walnuts	41	33
WA	Benton	Outdr Plants	216	389
WA	Benton	Cherries	3219	1207
WA	Benton	Pears	472	472
WA	Chelan	Outdr Plants	160	288
WA	Chelan	Pears	472	472
WA	Chelan	Cherries	3219	1206
WA	Chelan	Christmas Trees	42	3
WA	Douglas	Forest	2	4
WA	Douglas	Cherries	2	1
WA	Douglas	Outdr Plants	11	20
WA	Grant	Walnuts	5	8
WA	Grant	Outdr Plants	6454	1614
WA	Grant	Cherries	3479	1305
WA	Grant	Pears	998	998
WA	Kittitas	Outdr Plants	224	403

WA	Kittitas	Forest	458972	917944
WA	Kittitas	Christmas Trees	23	2
WA	Okanogan	Walnuts	29	23
WA	Okanogan	Christmas Trees	22	2
WA	Okanogan	Pears	3280	3280
WA	Okanogan	Forest	1499171	2998342
WA	Okanogan	Cherries	1003	376
WA	Okanogan	Outdr Plants	111	200
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3
WA	Franklin	Outdr Plants	1982	3568
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885
WA	Yakima	Filberts	6	2
WA	Yakima	Peppers	439	165
WA	Yakima	Cherries	8129	3048
WA	Yakima	Walnuts	11	3
WA	Yakima	Outdr Plants	821	205
WA	Yakima	Forest	517340	1034600
WA	Yakima	Pears	10190	10190

Table 26. Washington and Oregon counties through which the Middle Columbia River steelhead ESU migrates

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop	Outdr Plants	82	13

OR	Clatsop	Christmas Trees	25	2
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75
WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322

WA	Wakiakum			None

The Middle Columbia River Steelhead ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

B. Chinook salmon

Chinook salmon *(Oncorhynchus tshawytscha)* is the largest salmon species; adults weighing over 120 pounds have been caught in North American waters. Like other Pacific salmon, chinook salmon are anadromous and die after spawning.

Juvenile stream- and ocean-type chinook salmon have adapted to different ecological niches. Ocean-type chinook salmon, commonly found in coastal streams, tend to utilize estuaries and coastal areas more extensively for juvenile rearing. They typically migrate to sea within the first three months of emergence and spend their ocean life in coastal waters. Summer and fall runs predominate for ocean-type chinook. Stream-type chinook are found most commonly in headwater streams and are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. They often have extensive offshore migrations before returning to their natal streams in the spring or summer months. Stream-type smolts are much larger than their younger ocean-type counterparts and are therefore able to move offshore relatively quickly.

Coast-wide, chinook salmon typically remain at sea for 2 to 4 years, with the exception of a small proportion of yearling males (called jack salmon) which mature in freshwater or return after 2 or 3 months in salt water. Ocean-type chinook salmon tend to migrate along the coast, while stream-type chinook salmon are found far from the coast in the central North Pacific. They return to their natal streams with a high degree of fidelity. Seasonal ‘‘runs’’ (i.e., spring, summer, fall, or winter), which may be related to local temperature and water flow regimes, have been identified on the basis of when adult chinook salmon enter freshwater to begin their spawning migration. Egg deposition must occur at a time to ensure that fry emerge during the following spring when the river or estuarine productivity is sufficient for juvenile survival and growth.

Adult female chinook will prepare a spawning bed, called a redds, in a stream area with suitable gravel composition, water depth and velocity. After laying eggs in a redds, adult chinook will guard the redds from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature. Historically, chinook salmon ranged as far south as the Ventura River, California, and their northern extent reaches the Russian Far East.

1. Sacramento River Winter-run Chinook Salmon ESU

The Sacramento River Winter-run chinook was emergency listed as threatened with critical habitat designated in 1989 (54FR32085-32088, August 4, 1989). This emergency listing provided interim protection and was followed by (1) a proposed rule to list the winter-run on March 20, 1990, (2) a second emergency rule on April 20, 1990, and (3) a formal listing on November 20, 1990 (59FR440-441, January 4, 1994). A somewhat expanded critical habitat was proposed in 1992 (57FR36626-36632, August 14, 1992) and made final in 1993 (58FR33212-33219, June 16, 1993). In 1994, the winter-run was reclassified as endangered because of significant declines and continued threats (59FR440-441, January 4, 1994).

Critical Habitat has been designated to include the Sacramento River from Keswick Dam, Shasta County (river mile 302) to Chipps Island (river mile 0) at the west end of the Sacramento-San Joaquin delta, and then westward through most of the fresh or estuarine waters, north of the Oakland Bay Bridge, to the ocean. Estuarine sloughs in San Pablo and San Francisco bays are excluded (58FR33212-33219, June 16, 1993).

Table 27 shows the diflubenzuron usage in California counties supporting the Sacramento River winter-run chinook salmon ESU. Use of Diflubenzuron in counties with the Sacramento River winter-run Chinook salmon ESU. Spawning areas are primarily in Shasta and Tehama counties above the Red Bluff diversion dam.

Table 27: California counties supporting the Sacramento River, winter-run chinook ESU.

County	Site	Acres Treated	lbs a.i. Applied
Alameda			None
Butte	Rice	2435	313
Contra Costa	Walnut	17	11
Glenn	Rice	1087	124
Marin			None
Sacramento	Rice	289	32
San Francisco			None
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	NR	1
Shasta			None
Solano	Walnut	10	9

Sonoma			None
Sutter	Public Health	NR	<1
Sutter	Rice	2394	293
Sutter	Walnut	78	19
Tehama			None
Yolo			None

Application of diflubenzuron within the Sacramento River, winter run, Chinook ESU is quite low, relative to the land mass involved. Its use will not affect the T&E species of interest either directly or indirectly from effects on its food source.

2. Snake River Fall-run Chinook Salmon ESU

The Snake River fall-run chinook salmon ESU was proposed as threatened in 1991 (56FR29547-29552, June 27, 1991) and listed about a year later (57FR14653-14663, April 22, 1992). Critical habitat was designated on December 28, 1993 (58FR68543-68554) to include all tributaries of the Snake and Salmon Rivers accessible to Snake River fall-run chinook salmon, except reaches above impassable natural falls and Dworshak and Hells Canyon Dams. The Clearwater River and Palouse River watersheds are included for the fall-run ESU, but not for the spring/summer run. This chinook ESU was proposed for reclassification on December 28, 1994 (59FR66784-57403) as endangered because of critically low levels, based on very sparse runs. However, because of increased runs in the subsequent year, this proposed reclassification was withdrawn (63FR1807-1811, January 12, 1998).

In 1998, NMFS proposed to revise the Snake River fall-run chinook to include those stocks using the Deschutes River (63FR11482-11520, March 9, 1998). The John Day, Umatilla, and Walla Walla Rivers would be included; however, fall-run chinook in these rivers are believed to have been extirpated. It appears that this proposal has yet to be finalized. I have not included these counties here; however, I would note that the Middle Columbia River steelhead ESU encompasses these basins, and crop information is presented in that section of this analysis.

Hydrologic units with spawning and rearing habitat for this fall-run chinook are the Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse. These units are in Baker, Umatilla, Wallowa, and Union counties in Oregon; Adams, Asotin, Columbia, Franklin, Garfield, Lincoln, Spokane, Walla Walla, and Whitman counties in Washington; and Adams, Benewah, Clearwater, Idaho, Latah, Lewis, Nez Perce, Shoshone, and Valley counties in Idaho. Custer and Lemhi counties in Idaho are not listed as part of the fall-run ESU, although they are included for the spring/summer-run ESU. Because only high elevation forested areas of Baker and Umatilla counties in Oregon are in the spawning and rearing areas for this fall-run chinook, they were excluded them from consideration because diflubenzuron would not be used in these areas.

Table 28 show the cropping information for Pacific Northwest counties where the Snake River fall-run chinook salmon ESU is located. Migration corridors are the same as those in Table 20.

Table 28 : Spawning/rearing areas supporting the Snake River Fall-run chinook salmon ESU

State	County	Site	Acres Treated	lbs a.i. Applied
ID	Adams	Forest	506136	1012272
ID	Adams	Outdr Plants	8	15
ID	Benewah			None
ID	Clearwater	Forest	801599	1603198
ID	Idaho	Pears	2	2
ID	Idaho	Forest	4431562	8863124
ID	Idaho	Christmas Trees	20	1
ID	Latah	Forest	113187	226374
ID	Latah	Pears	2	2
ID	Latah	Christmas Trees	78	6
ID	Lewis			None
ID	Nez Perce	Forest	50563	101126
ID	Shoshone	Forest	2227613	4455226
OR	Union	Forest	617313	1234626
OR	Wallowa	Forest	1149951	2299902
WA	Adams	Outdr Plants	1331	333
WA	Asotin	Cherries	17	6
WA	Asotin	Forest	53797	107594
WA	Asotin	Pears	6	6
WA	Franklin	Pears	156	156

WA	Franklin	Walnuts	5	8
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Cherries	2165	812
WA	Franklin	Mushrooms	7	140
WA	Garfield	Forest	476495	952990
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885

The Snake River, Fall-run Chinook Salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

3. Snake River Spring/Summer-run Chinook Salmon

The Snake River Spring/Summer-run chinook salmon ESU was proposed as threatened in 1991 (56FR29542-29547, June 27, 1991) and listed about a year later (57FR14653-14663, April 22, 1992). Critical habitat was designated on December 28, 1993 (58FR68543-68554) to include all tributaries of the Snake and Salmon Rivers (except the Clearwater River) accessible to Snake River spring/summer chinook salmon. Like the fall-run chinook, the spring/summer-run chinook ESU was proposed for reclassification on December 28, 1994 (59FR66784-57403) as endangered because of critically low levels, based on very sparse runs. However, because of increased runs in subsequent year, this proposed reclassification was withdrawn (63FR1807-1811, January 12, 1998).

Hydrologic units in the potential spawning and rearing areas include Hells Canyon, Imnaha, Lemhi, Little Salmon, Lower Grande Ronde, Lower Middle Fork Salmon, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon - Panther, Pahsimerol, South Fork Salmon, Upper Middle Fork Salmon, Upper Grande Ronde, Upper Salmon, and Wallowa. Areas above Hells Canyon Dam are excluded, along with unnamed "impassable natural falls". Napias Creek Falls, near Salmon, Idaho, was later named an upstream barrier (64FR57399-57403, October 25, 1999). The Grande Ronde, Imnaha, Salmon, and Tucannon subbasins, and Asotin, Granite, and Sheep Creeks were specifically named in the Critical Habitat Notice.

Spawning and rearing counties mentioned in the Critical Habitat Notice include Union, Umatilla, Wallowa, and Baker counties in Oregon; Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley counties in Idaho; and Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman counties in Washington. However, Umatilla and Baker counties in Oregon and Blaine County in Idaho are excluded because accessible river reaches are all well above areas where diflubenzuron can be used. Counties with migratory corridors are all of those down stream from the confluence of the Snake and Columbia Rivers.

Table 29 shows the counties where the Snake River spring/summer-run chinook salmon ESU occurs. The cropping information for the migratory corridors is the same as for the Snake River fall-run chinook salmon and is in the Table 21.

Table 29: Spawning/rearing area supporting the Snake River spring/summer chinook ESU

State	County	Site	Acres Treated	lbs a.i. Applied
ID	Adams	Forest	506136	1012272
ID	Adams	Outdr Plants	8	15
ID	Benewah			None
ID	Clearwater	Forest	801599	1603198
ID	Idaho	Pears	2	2
ID	Idaho	Forest	4431562	8863124
ID	Idaho	Christmas Trees	20	1
ID	Latah	Forest	113187	226374
ID	Latah	Christmas Trees	78	6
ID	Latah	Pears	2	2
ID	Lewis			None
ID	Nez Perce	Forest	50563	101126
ID	Shoshone	Forest	2227613	4455226
ID	Valley	Forest	2037245	4074490
OR	Union	Forest	617313	1234626
OR	Wallowa	Forest	1149951	2299902
WA	Asotin	Forest	53797	107594
WA	Asotin	Cherries	17	6
WA	Asotin	Pears	6	6

WA	Franklin	Pears	156	156
WA	Franklin	Walnuts	5	8
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Cherries	2165	812
WA	Franklin	Mushrooms	7	140
WA	Garfield	Forest	476495	952990
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885

The Snake River spring/summer Chinook salmon ESU courses through large forest areas and focal agricultural centers. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

4. Central Valley Spring-run Chinook Salmon ESU

The Central valley Spring-run chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed on September 16, 1999 (64FR50393-50415). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in the Sacramento River and its tributaries in California, along with the down stream river reaches into San Francisco Bay, north of the Oakland Bay Bridge, and to the Golden Gate Bridge

Hydrologic units and upstream barriers within this ESU are the Sacramento-Lower Cow-Lower Clear, Lower Cottonwood, Sacramento-Lower Thomas (upstream barrier - Black Butte Dam), Sacramento-Stone Corral, Lower Butte (upstream barrier - Chesterville Dam), Lower Feather (upstream barrier - Orville Dam), Lower Yuba, Lower Bear (upstream barrier - Camp Far West Dam), Lower Sacramento, Sacramento-Upper Clear (upstream barriers - Keswick Dam, Whiskey town dam), Upper Elder-Upper Thomas, Upper Cow-Battle, Mill-Big Chico, Upper Butte, Upper Yuba (upstream barrier - Englebright Dam), Suisin Bay, San Pablo Bay, and San Francisco Bay. These areas are said to be in the counties of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yolo, Yuba, Placer, Sacramento, Solano, Nevada, Contra Costa, Napa, Alameda, Marin, Sonoma, San Mateo, and San Francisco. I note, however, with San Mateo County being well south of the Oakland Bay Bridge, it is difficult to see why this county was included.

Table 30: California counties supporting the Central Valley spring-run chinook

salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Alameda			None
Butte	Rice	2435	312
Calaveras			None
Colusa	Rice	1063	119
Contra Costa	Walnut	17	11
Glenn	Rice	1087	124
Merced	Walnut	173	44
Marin			None
Placer	Rice	727	94
Sacramento	Rice	289	32
San Francisco			None
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	NR	1
Shasta			None
Solano	Walnut	30	9
Sonoma			None
Sutter	Rice	2395	293
Sutter	Walnut	78	19
Tehama			None
Yolo			None

Application of diflubenzuron within the California Central Valley, spring-run, Chinook ESU is quite low, relative to the land mass involved. The absence of residential use further reduces the potential for impact. Its use will have no effects on the T&E species of interest either directly or indirectly, through loss of its food source.

5. California Coastal Chinook Salmon ESU

The California coastal chinook salmon ESU was proposed as threatened in 1998

(63FR11482-11520, March 9, 1998) and listed on September 16, 1999 (64FR50393-50415). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches and estuarine areas accessible to listed chinook salmon from Redwood Creek (Humboldt County, California) to the Russian River (Sonoma County, California), inclusive.

The Hydrologic units and upstream barriers are Mad-Redwood, Upper Eel (upstream barrier - Scott Dam), Middle Fort Eel, Lower Eel, South Fork Eel, Mattole, Big-Navarro-Garcia, Gualala-Salmon, Russian (upstream barriers - Coyote Dam; Warm Springs Dam), and Bodega Bay. Counties with agricultural areas where diflubenzuron could be used are Humboldt, Trinity, Mendocino, Lake, Sonoma, and Marin.

Table 31: California counties supporting the California coastal chinook salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Glenn	Rice	1087	124
Humbolt			None
Lake			None
Marin			None
Mendocino			None
Sonoma			None
Trinity			None

There is use of diflubenzuron only within Glenn county, which is minimally associated with the California Coastal Chinook Salmon ESU, and it will have no effects on the T&E species of interest directly or indirectly, through loss of its food source.

6. Puget Sound Chinook Salmon ESU

The Puget Sound chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all marine, estuarine, and river reaches accessible to listed chinook salmon in Puget Sound and its tributaries, extending out to the Pacific Ocean.

The Hydrologic units and upstream barriers are the Strait of Georgia, San Juan Islands, Nooksack, Upper Skagit, Sauk, Lower Skagit, Stillaguamish, Skykomish, Snoqualmie (upstream barrier - Tolt Dam), Snohomish, Lake Washington (upstream barrier - Landsburg Diversion), Duwamish, Puyallup, Nisqually (upstream barrier - Alder Dam), Deschutes, Skokomish, Hood Canal, Puget Sound, Dungeness-Elwha (upstream barrier - Elwha Dam). Affected counties in Washington, apparently all of which could have spawning and rearing habitat, are Skagit, Whatcom, San Juan, Island, Snohomish, King, Pierce, Thurston, Lewis, Grays Harbor, Mason, Clallam, Jefferson, and Kitsap.

Table 32: Washington counties where the Puget Sound chinook salmon ESU is located.

State	County	Site	Acres Treated	lbs a.i. Applied
WA	Clallum	Cherries	3707	1390
WA	Clallum	Pears	8209	8208
WA	Clallum	Outdr Plants	157	33
WA	Clallum	Forest	199209	398418
WA	Grays Harbor	Christmas Trees	18	1
WA	Grays Harbor	Outdr Plants	454	114
WA	Grays Harbor	Forest	139501	279002
WA	Jefferson	Christmas Trees	13	1
WA	Jefferson	Outdr Plants	64	16
WA	Jefferson	Forest	169096	336192
WA	King	Cherries	8	3
WA	King	Pears	19	19
WA	King	Outdr Plants	804	201
WA	King	Christmas Trees	207	15
WA	King	Forest	360553	721106
WA	Kitsap	Christmas Trees	874	61
WA	Kitsap	Pears	4	4
WA	Kitsap	Outdr Plants	2202	551
WA	Kitsap	Cherries	6	2
WA	Lewis	Cherries	10	4
WA	Lewis	Christmas Trees	4042	283
WA	Lewis	Forest	445670	891340
WA	Lewis	Outdr Plants	7663	1916

WA	Lewis	Pears	1	1
WA	Lewis	Outdr Plants	2445	611
WA	Mason	Pears	1	1
WA	Mason	Forest	127152	254302
WA	Pierce	Cherries	5	2
WA	Pierce	Christmas Trees	63	4
WA	Pierce	Pears	4	4
WA	Pierce	Outdr Plants	2233	558
WA	Pierce	Forest	131406	262812
WA	San Juan	Outdr Plants	35	9
WA	Skagit	Christmas Trees	83	6
WA	Skagit	Outdr Plants	7084	1771
WA	Skagit	Pears	5	5
WA	Skagit	Forest	376751	753502
WA	Snohomish	Cherries	3	1
WA	Snohomish	Pears	27	27
WA	Snohomish	Christmas Trees	82	6
WA	Snohomish	Outdr Plants	1728	432
WA	Snohomish	Forest	639464	1278928
WA	Thurston	Forest	10	20
WA	Thurston	Pears	5	5
WA	Thurston	Christmas Trees	187	13
WA	Thurston	Outdr Plants	1723	431
WA	Thurston	Cherries	4	2
WA	Whatcom	Cherries	4	2
WA	Whatcom	Pears	15	15
WA	Whatcom	Christmas Trees	157	11

WA	Whatcom	Outdr Plants	696	174
WA	Whatcom	Forest	458290	916588

The Upper Columbia River Steelhead ESU courses through large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

7. Lower Columbia River Chinook Salmon ESU

The Lower Columbia River chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive, along with the lower Columbia River reaches to the Pacific Ocean.

The Hydrologic units and upstream barriers are the Middle Columbia-Hood (upstream barriers - Condit Dam, The Dalles Dam), Lower Columbia-Sandy (upstream barrier - Bull Run Dam 2), Lewis (upstream barrier - Merlin Dam), Lower Columbia-Clatskanie, Upper Cowlitz, Lower Cowlitz, Lower Columbia, Clackamas, and the Lower Willamette. Spawning and rearing habitat would be in the counties of Hood River, Waco, Columbia, Clackamas, Marion, Multnomah, and Washington in Oregon, and Klickitat, Skamania, Clark, Cowlitz, Lewis, Wahkiakum, Pacific, Yakima, and Pierce in Washington. Clatsop County appears to be the only county in the critical habitat that does not contain spawning and rearing habitat, although there is only a small part of Marion County that is included as critical habitat.

Table 33: Oregon and Washington counties where the Lower Columbia River chinook salmon ESU occurs.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clackamas	Cherries	53	20
OR	Clackamas	Peppers	29	11
OR	Clackamas	Pears	37	37
OR	Clackamas	Filberts	3994	5991
OR	Clackamas	Walnuts	51	77
OR	Clackamas	Outdr Plants	29217	7304
OR	Clackamas	Christmas Trees	7532	527

OR	Clackamas	Forest	382374	764748
OR	Clackamus	Peppers		3
OR	Clatsop	Outdr Plants	82	13
OR	Clatsop	Christmas Trees	25	2
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Marion	Peppers	33	12
OR	Marion	Cherries	1568	588
OR	Marion	Pears	150	150
OR	Marion	Filberts	7061	10592
OR	Marion	Walnuts	155	233
OR	Marion	Outdr Plants	21309	5327
OR	Marion	Christmas Trees	3712	260
OR	Marion	Forest	202970	405940
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
OR	Washington			None

WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75
WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Klickitat	Cherries	457	171
WA	Klickitat	Forest	34537	69074
WA	Klckitat	Pears	331	331
WA	Lewis	Cherries	10	4
WA	Lewis	Christmas Trees	4042	283
WA	Lewis	Forest	445670	891340
WA	Lewis	Outdr Plants	7663	1916
WA	Lewis	Pears	1	1
WA	Lewis	Outdr Plants	2445	611
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Pierce	Cherries	5	2
WA	Pierce	Christmas Trees	63	4
WA	Pierce	Pears	4	4
WA	Pierce	Outdr Plants	2233	558
WA	Pierce	Forest	131406	262812
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132

WA	Skamania	Nuts (in shell)	4	3
WA	Wakiakum			None

The Lower Columbia River Chinook salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is unlikely to adversely affect, the listed species.

8. Upper Willamette River Chinook Salmon ESU

The Upper Willamette River Chinook Salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in the Clackamas River and the Willamette River and its tributaries above Willamette Falls, in addition to all down stream river reaches of the Willamette and Columbia Rivers to the Pacific Ocean.

The Hydrologic units included are the Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, Middle Fork Willamette, Coast Fork Willamette (upstream barriers - Cottage Grove Dam, Dorena Dam), Upper Willamette (upstream barrier - Fern Ridge Dam), McKenzie (upstream barrier - Blue River Dam), North Santiam (upstream barrier - Big Cliff Dam), South Santiam (upstream barrier - Green Peter Dam), Middle Willamette, Yamhill, Molalla-Pudding, Tualatin, Clackamas, and Lower Willamette. Spawning and rearing habitat is in the Oregon counties of Clackamas, Douglas, Lane, Benton, Lincoln, Linn, Polk, Marion, Yamhill, Washington, and Tillamook. However, Lincoln and Tillamook counties include salmon habitat only in the forested parts of the coast range where diflubenzuron would not be used. Salmon habitat for this ESU is exceedingly limited in Douglas County also, but we cannot rule out future Diflubenzuron use in Douglas County.

Tables 34 and 35 show the cropping information for Oregon counties where the Upper Willamette River chinook salmon ESU occurs and for the Oregon and Washington counties where this ESU migrates.

Table 34: Spawning/Rearing areas for the Upper Willamette River chinook ESU

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Benton	Cherries	18	7
OR	Benton	Pears	7	7
OR	Benton	Filberts	493	740
OR	Benton	Walnuts	23	35

OR	Benton	Christmas Trees	1983	139
OR	Benton	Outdr Plants	6212	1553
OR	Benton	Peppers	5	2
OR	Clackamas	Cherries	53	20
OR	Clackamas	Peppers	29	11
OR	Clackamas	Pears	37	37
OR	Clackamas	Filberts	3994	5991
OR	Clackamas	Walnuts	51	77
OR	Clackamas	Outdr Plants	29217	7304
OR	Clackamas	Christmas Trees	7532	527
OR	Clackamas	Forest	382374	764748
OR	Douglas	Forest	1002200	2004400
OR	Douglas	Peppers	29	11
OR	Douglas	Cherries	64	24
OR	Douglas	Pears	105	105
OR	Douglas	Filberts	55	83
OR	Douglas	Walnuts	171	257
OR	Douglas	Outdr Plants	1428	357
OR	Douglas	Christmas Trees	431	30
OR	Lane	Forest	403315	806638
OR	Lane	Peppers	17	6
OR	Lane	Cherries	249	93
OR	Lane	Pears	51	51
OR	Lane	Filberts	3677	5516
OR	Lane	Walnuts	105	168
OR	Lane	Outdr Plants	3563	891
OR	Lane	Christmas Trees	1055	74

OR	Linn	Forest	464463	928925
OR	Linn	Cherries	157	59
OR	Linn	Pears	26	26
OR	Linn	Filberts	1820	2730
OR	Linn	Walnuts	55	83
OR	Linn	Outdr Plants	1583	396
OR	Linn	Christmas Trees	292	20
OR	Marion	Peppers	33	12
OR	Marion	Cherries	1568	588
OR	Marion	Pears	150	150
OR	Marion	Filberts	7061	10592
OR	Marion	Walnuts	155	233
OR	Marion	Outdr Plants	21309	5327
OR	Marion	Christmas Trees	3712	260
OR	Marion	Forest	202970	405940
OR	Polk	Forest	1479	2958
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
OR	Washington	Cherries	211	79
OR	Washington	Pears	69	69
OR	Washington	Filberts	5595	8393
OR	Washington	Walnuts	679	1019
OR	Washington	Outdr Plants	7538	1885
OR	Washington	Christmas Trees	1411	99
OR	Washington	Peppers	2	1

OR	Yamhill	Cherries	211	79
OR	Yamhill	Pears	54	54
OR	Yamhill	Filberts	7110	10665
OR	Yamhill	Walnuts	808	1212
OR	Yamhill	Outdr Plants	5590	1398
OR	Yamhill	Christmas Trees	556	39
OR	Yamhill	Forest	25423	50846

Table 35: Migration corridors of the Upper Willamette River chinook salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop	Outdr Plants	82	13
OR	Clatsop	Christmas Trees	25	2
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
WA	Clark	Forest	1183	2366
WA	Clark	Pears	75	75
WA	Clark	Christmas Trees	358	25
WA	Cowlitz	Pears	3	3

WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322

The Upper Willamette River Chinook salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species appears most appropriate.

9. Upper Columbia River Spring-run Chinook Salmon ESU

The Upper Columbia River Spring-run Chinook Salmon ESU was proposed as endangered in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River, as well as all down stream migratory corridors to the Pacific Ocean. Hydrologic units and their upstream barriers are Chief Joseph (Chief Joseph Dam), Similkameen, Methow, Upper Columbia-Entiat, Wenatchee, Upper Columbia-Priest Rapids, Middle Columbia-Lake Wallula, Middle Columbia-Hood, Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, and Lower Willamette. Counties in which spawning and rearing occur are Chelan, Douglas, Okanogan, Grant, Kittitas, and Benton (Table 36), with the lower river reaches being migratory corridors (Table 37).

Most diflubenzuron usage occurs upstream from the confluence of the Snake River with the Columbia River, but not as far north as Chelan, and Okanogan counties, where there is limited acreage of potato, the only crop for diflubenzuron. However, a modest amount is used on potato below that confluence in counties on either side of the Columbia River, but all upstream of the John Day Dam.

Tables 36 and 37 show the cropping information for Washington counties that support the Upper Columbia River chinook salmon ESU and for the Oregon and Washington counties where this ESU migrates.

Table 36. Counties Supporting the Upper Columbia Chinook ESU Spawning/Rearing Area

State	County	Site	Acres Treated	lbs a.i. Applied
WA	Benton	Walnuts	41	33
WA	Benton	Outdr Plants	216	389
WA	Benton	Cherries	3219	1207
WA	Benton	Pears	472	472
WA	Chelan	Outdr Plants	160	288
WA	Chelan	Pears	472	472
WA	Chelan	Christmas Trees	42	3
WA	Douglas	Pears	1104	1104
WA	Douglas	Outdr Plants	11	20
WA	Grant	Walnuts	5	8
WA	Grant	Outdr Plants	6454	1614
WA	Grant	Cherries	3479	1305
WA	Grant	Pears	998	998
WA	Kittitas	Outdr Plants	224	403
WA	Kittitas	Forest	458972	917944
WA	Kittitas	Pears	331	331
WA	Kittitas	Christmas Trees	23	2
WA	Okanogan	Walnuts	29	23
WA	Okanogan	Christmas Trees	22	2
WA	Okanogan	Pears	3280	3280
WA	Okanogan	Forest	1499171	2998342
WA	Okanogan	Cherries	1003	376
WA	Okanogan	Outdr Plants	111	200
WA	Skamania	Pears	477	477

WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3

Table 37: Migration corridors for the Upper Columbia River Chinook salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop			None
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Gilliam			None
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Morrow	Forest	143305	286618
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Sherman			None
OR	Umatilla	Cherries	349	131
OR	Umatilla	Pears	4	4
OR	Umatilla	Outdr Plants	396	99

OR	Umatilla	Forest	401714	803428
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385
OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Franklin	Pears	156	156
WA	Franklin	Walnuts	5	8
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Cherries	2165	812
WA	Franklin	Mushrooms	7	140
WA	Klickitat	Cherries	457	171
WA	Klickitat	Forest	34537	69074
WA	Klckitat	Pears	331	331
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885

WA	Yakima	Filberts	6	2
WA	Yakima	Peppers	439	165
WA	Yakima	Walnuts	11	3
WA	Yakima	Outdr Plants	821	205
WA	Yakima	Cherries	8129	3048
WA	Yakima	Forest	517340	1034600
WA	Yakima	Pears	10190	10190

The Upper Columbia River Chinook salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use, with the exception of a major grasshopper infestation, appears unlikely based on data from local agencies. Diflubenzuron may affect, but is unlikely to adversely affect, the listed species.

C. Coho Salmon

Coho salmon, *Oncorhynchus kisutch*, were historically distributed throughout the North Pacific Ocean from central California to Point Hope, AK, through the Aleutian Islands into Asia. Historically, this species probably inhabited most coastal streams in Washington, Oregon, and central and northern California. Some populations may once have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington and the Snake River in Idaho.

Coho salmon generally exhibit a relatively simple, 3 year life cycle. Adults typically begin their freshwater spawning migration in the late summer and fall, spawn by mid-winter, then die. Southern populations are somewhat later and spend much less time in the river prior to spawning than do northern coho. Homing fidelity in coho salmon is generally strong; however their small tributary habitats experience relatively frequent, temporary blockages, and there are a number of examples in which coho salmon have rapidly re-colonized vacant habitat that had only recently become accessible to anadromous fish.

After spawning in late fall and early winter, eggs incubate in redds for 1.5 to 4 months, depending upon the temperature, before hatching as alevins. Following yolk sac absorption, alevins emerge and begin actively feeding as fry. Juveniles rear in fresh water for up to 15 months, then migrate to the ocean as ‘‘smolts’’ in the spring. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream. They are most frequently recovered from ocean waters in the vicinity of their spawning streams, with a minority being recovered at adjacent coastal areas, decreasing in number with distance from the natal streams.

However, those coho released from Puget Sound, Hood Canal, and the Strait of Juan de Fuca are caught at high levels in Puget Sound, an area not entered by coho salmon from other areas.

1. Central California Coast Coho Salmon ESU

The Central California Coast Coho Salmon ESU includes all coho naturally reproduced in streams between Punta Gorda, Humboldt County, CA and San Lorenzo River, Santa Cruz County, CA, inclusive. This ESU was proposed in 1995 (60FR38011-38030, July 25, 1995) and listed as threatened, with critical habitat designated, on May 5, 1999 (64FR24049-24062). Critical habitat consists of accessible reaches along the coast, including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay.

Hydrologic units within the boundaries of this ESU are: San Lorenzo-Soquel (upstream barrier - Newell Dam), San Francisco Coastal South, San Pablo Bay (upstream barrier - Phoenix Dam- Phoenix Lake), Tomales-Drake Bays (upstream barriers - Peters Dam-Kent Lake; Seeger Dam-Nicasio Reservoir), Bodega Bay, Russian (upstream barriers - Warm springs dam-Lake Sonoma; Coyote Dam-Lake Mendocino), Gualala-Salmon, and Big-Navarro-Garcia. California counties included are Santa Cruz, San Mateo, Marin, Napa, Sonoma, and Mendocino.

Table 38: California counties supporting the Central California coast Coho salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Marin			None
Mendocino			None
Napa			None
San Mateo	Artichoke	157	16
San Mateo	Outdr Plants	NR	1
Santa Cruz	Mushrooms	NR	29
Santa Cruz	Outdr Plants	15	2
Santa Cruz	Structural Pest Cont	NR	1
Sonoma			None

Diflubenzuron is used in small quantities within the Central California coast Coho salmon ESU and will have no effects on the species of concern either directly or indirectly, through loss of its food source.

2. Southern Oregon/Northern California Coast Coho Salmon ESU

The Southern Oregon/Northern California coastal coho salmon ESU was proposed as threatened in 1995 (60FR38011-38030, July 25, 1995) and listed on May 6, 1997 (62FR24588-24609). Critical habitat was proposed later that year (62FR62741-62751, November 25, 1997) and finally designated on May 5, 1999 (64FR24049-24062) to encompass accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive.

The Southern Oregon/Northern California Coast coho salmon ESU occurs between Punta Gorda, Humboldt County, California and Cape Blanco, Curry County, Oregon. Major basins with this salmon ESU are the Rogue, Klamath, Trinity, and Eel river basins, while the Elk River, Oregon, and the Smith and Mad Rivers, and Redwood Creek, California are smaller basins within the range. Hydrologic units and the upstream barriers are Mattole, South Fork Eel, Lower Eel, Middle Fork Eel, Upper Eel (upstream barrier - Scott Dam-Lake Pillsbury), Mad-Redwood, Smith, South Fork Trinity, Trinity (upstream barrier - Lewiston Dam-Lewiston Reservoir), Salmon, Lower Klamath, Scott, Shasta (upstream barrier - Dwinnell Dam-Dwinnell Reservoir), Upper Klamath (upstream barrier - Irongate Dam-Irongate Reservoir), Chetco, Illinois (upstream barrier - Selmac Dam-Lake Selmac), Lower Rogue, Applegate (upstream barrier - Applegate Dam-Applegate Reservoir), Middle Rogue (upstream barrier - Emigrant Lake Dam-Emigrant Lake), Upper Rogue (upstream barriers - Agate Lake Dam-Agate Lake; Fish Lake Dam-Fish Lake; Willow Lake Dam-Willow Lake; Lost Creek Dam-Lost Creek Reservoir), and Sixes. Related counties are Humboldt, Mendocino, Trinity, Glenn, Lake, Del Norte, Siskiyou in California and Curry, Jackson, Josephine, and Douglas, in Oregon. However, I have excluded Glenn County, California from this analysis because the salmon habitat in this county is not near the agricultural areas where diflubenzuron can be used. Klamath county is excluded because it lies beyond an impassable barrier.

Table 39 shows the usage of diflubenzuron in the California counties supporting the Southern Oregon/Northern California coastal coho salmon ESU. Table 40 shows the cropping information for Oregon counties where the Southern Oregon/Northern California coastal coho salmon ESU occurs..

Table 39:California Counties where the Southern Oregon/Northern California Coastal Coho Salmon ESU Occurs

County	Site	Acres Treated	Lbs a.i. Applied
Del Norte			None
Humbolt			None
Lake			None
Mendocino			None

Trinity			None

Table 40: Oregon counties where there is habitat for the Southern Oregon/Northern California coastal coho salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Curry	Cherries	4	2
OR	Curry	Pears	3	3
OR	Curry	Outdr Plants	182	46
OR	Curry	Christmas Trees	16	1
OR	Curry	Forest	616694	1233388
OR	Douglas	Forest	1002200	2004400
OR	Douglas	Peppers	29	11
OR	Douglas	Cherries	64	24
OR	Douglas	Pears	105	105
OR	Douglas	Filberts	55	83
OR	Douglas	Walnuts	171	257
OR	Douglas	Outdr Plants	1428	357
OR	Douglas	Christmas Trees	431	30
OR	Jackson	Peppers	9	3
OR	Jackson	Cherries	27	10
OR	Jackson	Pears	9387	9387
OR	Jackson	Filberts	55	83
OR	Jackson	Walnuts	27	41
OR	Jackson	Outdr Plants	178	45
OR	Jackson	Christmas Trees	55	4
OR	Jackson	Forest	448524	897048
OR	Josephine	Forest	401084	802168
OR	Josephine	Cherries	9	3

OR	Josephine	Walnuts	18	27
OR	Josephine	Outdr Plants	329	82
OR	Josephine	Christmas Trees	177	12

The Northern California/Southern Oregon Coastal salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

3. Oregon Coast coho salmon ESU

The Oregon coast coho salmon ESU was first proposed for listing as threatened in 1995 (60FR38011-38030, July 25, 1995), and listed several years later 63FR42587-42591, August 10, 1998). Critical habitat was proposed in 1999 (64FR24998-25007, May 10, 1999) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes coastal populations of coho salmon from Cape Blanco, Curry County, Oregon to the Columbia River. Spawning is spread over many basins, large and small, with higher numbers further south where the coastal lake systems (e.g., the Tenmile, Tahkenitch, and Siltcoos basins) and the Coos and Coquille Rivers have been particularly productive. Critical Habitat includes all accessible reaches in the coastal Hydrologic reaches Necanicum, Nehalem, Wilson-Trask-Nestucca (upstream barrier - McGuire Dam), Siletz-Yaquina, Alsea, Siuslaw, Siltcoos, North Umpqua (upstream barriers - Cooper Creek Dam, Soda Springs Dam), South Umpqua (upstream barrier - Ben Irving Dam, Galesville Dam, Win Walker Reservoir), Umpqua, Coos (upstream barrier - Lower Pony Creek Dam), Coquille, Sixes. Related Oregon counties are Douglas, Lane, Coos, Curry, Benton, Lincoln, Polk, Tillamook, Yamhill, Washington, Columbia, Clatsop. .

Table 41: Oregon counties where the Oregon coast coho salmon ESU occurs.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Benton	Cherries	18	7
OR	Benton	Pears	7	7
OR	Benton	Filberts	493	740
OR	Benton	Walnuts	23	35
OR	Benton	Christmas Trees	1983	139

OR	Benton	Outdr Plants	6212	1553
OR	Benton	Peppers	5	2
OR	Clatsop			None
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Coos	Cherries	11	4
OR	Coos	Pears	4	4
OR	Coos	Filberts	1	2
OR	Coos	Walnuts	1	2
OR	Coos	Outdr Plants	74	19
OR	Coos	Forest	80568	161136
OR	Curry	Forest	616694	1233388
OR	Douglas	Forest	1002200	2004400
OR	Douglas	Peppers	29	11
OR	Douglas	Cherries	64	24
OR	Douglas	Pears	105	105
OR	Douglas	Filberts	55	83
OR	Douglas	Walnuts	171	257
OR	Douglas	Outdr Plants	1428	357
OR	Douglas	Christmas Trees	431	30
OR	Lane	Forest	403315	806638
OR	Lane	Peppers	17	6
OR	Lane	Cherries	249	93
OR	Lane	Pears	51	51

OR	Lane	Filberts	3677	5516
OR	Lane	Walnuts	105	168
OR	Lane	Outdr Plants	3563	891
OR	Lane	Christmas Trees	1055	74
OR	Lincoln	Forest	174167	348334
OR	Lincoln	Christmas Trees	76	5
OR	Lincoln	Outdr Plants	118	30
OR	Lincoln	Pears	1	1
OR	Polk	Forest	91448	182896
OR	Polk	Cherries	1888	708
OR	Polk	Pears	83	83
OR	Polk	Filberts	2394	3591
OR	Polk	Walnuts	33	50
OR	Polk	Christmas Trees	644	45
OR	Polk	Outdr Plants	6638	1660
OR	Tillamook	Forest	91448	182896
OR	Tillamook	Outdr Plants	86	21
OR	Washington	Cherries	211	79
OR	Washington	Pears	69	69
OR	Washington	Filberts	5595	8393
OR	Washington	Walnuts	679	1019
OR	Washington	Outdr Plants	7538	1885
OR	Washington	Christmas Trees	1411	99
OR	Washington	Peppers	2	1
OR	Yamhill	Cherries	211	79
OR	Yamhill	Pears	54	54
OR	Yamhill	Filberts	7110	10665

OR	Yamhill	Walnuts	808	1212
OR	Yamhill	Outdr Plants	5590	1398
OR	Yamhill	Christmas Trees	556	39
OR	Yamhill	Forest	25423	50846

The Oregon Coastal salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

D. Chum Salmon

Chum salmon, *Oncorhynchus keta*, have the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean. Chum salmon have been documented to spawn from Asia around the rim of the North Pacific Ocean to Monterey Bay in central California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Most chum salmon mature between 3 and 5 years of age, usually 4 years, with younger fish being more predominant in southern parts of their range. Chum salmon usually spawn in coastal areas, typically within 100 km of the ocean where they do not have surmount river blockages and falls. However, in the Skagit River, Washington, they migrate at least 170 km.

During the spawning migration, adult chum salmon enter natal river systems from June to March, depending on characteristics of the population or geographic location. . In Washington, a variety of seasonal runs are recognized, including summer, fall, and winter populations. Fall-run fish predominate, but summer runs are found in Hood Canal, the Strait of Juan de Fuca, and in southern Puget Sound, and two rivers in southern Puget Sound have winter-run fish.

Redds are usually dug in the mainstem or in side channels of rivers. Juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions than on favorable estuarine and marine conditions.

1. Hood Canal Summer-run chum salmon ESU

The Hood Canal summer-run chum salmon ESU was proposed for listing as threatened, and critical habitat was proposed, in 1998 (63FR11774-11795, March 10, 1998). The final listing was published a year later (63FR14508-14517, March 25, 1999), and critical habitat was designated in 2000 (65FR7764-7787).

Critical habitat for the Hood Canal ESU includes Hood Canal, Admiralty Inlet, and the straits of Juan de Fuca, along with all river reaches accessible to listed chum salmon draining into Hood Canal as well as Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. The Hydrologic units are Skokomish (upstream boundary - Cushman Dam), Hood Canal, Puget Sound, Dungeness-Elwha, in the counties of Mason, Clallam, Jefferson, Kitsap, and Island.

Streams specifically mentioned, in addition to Hood Canal, in the proposed critical habitat Notice include Union River, Tahuya River, Big Quilcene River, Big Beef Creek, Anderson Creek, Dewatto River, Snow Creek, Salmon Creek, Jimmycomelately Creek, Duckabush ‘stream’, Hamma Hamma ‘stream’, and Dosewallips ‘stream’.

Tables 42: Washington counties where the Hood Canal summer-run chum salmon ESU Occurs.

State	County	Site	Acres Treated	lbs a.i. Applied
WA	Clallum	Pears	8298	8298
WA	Clallum	Forest	199209	398418
WA	Island			None
WA	Jefferson	Forest	168096	336192
WA	Kitsap	Christmas Trees	874	61

The Hood Canal is a rather well protected body of water in a largely undeveloped portion of Washington State. It is closed to the south and opens to the Straits of Juan de Fuca in the north. To the west, the back ranges of the Olympic Mountains form a protective crest, while to the east the canal is separated by land from Puget Sound and the developed portions of the Puget Sound Basin. As is seen in Table 43, agricultural use of diflubenzuron is minimal, however potential use in forested areas of Clallum and Jefferson counties could have indirect effects on the species of concern. For this reason diflubenzuron may indirectly affect, but is not likely to adverse affect, the summer-run, Hood Canal, summer-run Chum salmon ESU.

2. Columbia River Chum Salmon ESU

The Columbia River chum salmon ESU was proposed for listing as threatened, and critical habitat was proposed, in 1998 (63FR11774-11795, March 10, 1998). The final listing was published a year later (63FR14508-14517, March 25, 1999), and critical habitat was designated in 2000 (65FR7764-7787).

Critical habitat for the Columbia River chum salmon ESU encompasses all accessible reaches and adjacent riparian zones of the Columbia River (including estuarine areas and tributaries) downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. These areas are the Hydrologic units of Lower Columbia - Sandy (upstream barrier - Bonneville Dam, Lewis (upstream barrier - Merlin Dam), Lower Columbia - Clatskanie, Lower Cowlitz, Lower Columbia, Lower Willamette in the counties of Clark, Skamania, Cowlitz, Wahkiakum, Pacific, Lewis, Washington and Multnomah, Clatsop, Columbia, and Washington, Oregon. It appears that there are three extant populations in Grays River, Hardy Creek, and Hamilton Creek.

Table 43: Oregon and Washington counties where the Columbia River chum salmon ESU occurs.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop			None
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Washington			None
WA	Clark	Pears	75	75
WA	Clark	Forest	1183	2366
WA	Clark	Christmas Trees	358	25

WA	Cowlitz	Pears	3	3
WA	Cowlitz	Filberts	1	2
WA	Cowlitz	Christmas Trees	16	1
WA	Cowlitz	Cherries	2	1
WA	Cowlitz	Forest	1183	2366
WA	Cowlitz	Outdr Plants	373	671
WA	Lewis	Cherries	10	4
WA	Lewis	Christmas Trees	4042	283
WA	Lewis	Forest	445670	891340
WA	Lewis	Outdr Plants	7663	1916
WA	Lewis	Pears	1	1
WA	Lewis	Outdr Plants	2445	611
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Skamania	Pears	477	477
WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3
WA	Wahkiakum			None

The Columbia River Chum salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

E. Sockeye Salmon

Sockeye salmon, *Oncorhynchus nerka*, are the third most abundant species of Pacific salmon, after pink and chum salmon. Sockeye salmon exhibit a wide variety of life history patterns that reflect varying dependency on the fresh water environment. The vast majority of sockeye salmon typically spawn in inlet or outlet tributaries of lakes or along the shoreline of lakes, where their distribution and abundance is closely related to the location of rivers that provide access to the lakes. Some sockeye, known as kokanee, are non-anadromous and have been observed on the spawning grounds together with their anadromous counterparts. Some sockeye, particularly the more northern populations, spawn in mainstem rivers.

Growth is influenced by competition, food supply, water temperature, thermal stratification, and other factors, with lake residence time usually increasing the farther north a nursery lake is located. In Washington and British Columbia, lake residence is normally 1 or 2 years. Incubation, fry emergence, spawning, and adult lake entry often involve intricate patterns of adult and juvenile migration and orientation not seen in other *Oncorhynchus* species.
Upon emergence from the substrate, lake-type sockeye salmon juveniles move either downstream or upstream to rearing lakes, where the juveniles rear for 1 to 3 years prior to migrating to sea. Smolt migration typically occurs beginning in late April and extending through early July.

Once in the ocean, sockeye salmon feed on copepods, euphausiids, amphipods, crustacean larvae, fish larvae, squid, and pteropods. They will spend from 1 to 4 years in the ocean before returning to freshwater to spawn. Adult sockeye salmon home precisely to their natal stream or lake. River-and sea-type sockeye salmon have higher straying rates within river systems than lake-type sockeye salmon.

1. Ozette Lake Sockeye Salmon ESU

The Ozette Lake sockeye salmon ESU was proposed for listing, along with proposed critical habitat in 1998 (63FR11750-11771, March 10, 1998). It was listed as threatened on March 25, 1999 (64FR14528-14536), and critical habitat was designated on February 16, 2000 (65FR7764-7787). This ESU spawns in Lake Ozette, Clallam County, Washington, as well as in its outlet stream and the tributaries to the lake. It has the smallest distribution of any listed Pacific salmon.

While Lake Ozette, itself, is part of Olympic National Park, its tributaries extend outside park boundaries, much of which is private land. There is limited agriculture in the whole of Clallam County, and most of this is well away from the Ozette watershed.

Table 44: Clallum County where there is habitat for the Ozette Lake sockeye salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
WA	Clallum	Pears	8298	8298
WA	Clallum	Forest	199209	398418

The Ozette Lake Sockeye Salmon ESU is located in a remote area of the most northwest county in Washington. There is minimal agriculture and most is located close to the large towns (i.e. Port Angeles). There are large forested areas, however these are not near the critical habitat. Ozette Lake is protected and located in a largely undeveloped area where tourism is a major industry. Duiflubenzuron will have no effect on this ESU.

2. Snake River Sockeye Salmon ESU

The Snake River sockeye salmon was the first salmon ESU in the Pacific Northwest to be listed. It was proposed and listed in 1991 (56FR14055-14066, April 5, 1991 & 56FR58619-58624, November 20, 1991). Critical habitat was proposed in 1992 (57FR57051-57056, December 2, 1992) and designated a year later (58FR68543-68554, December 28, 1993) to include river reaches of the mainstem Columbia River, Snake River, and Salmon River from its confluence with the outlet of Stanley Lake down stream, along with Alturas Lake Creek, Valley Creek, and Stanley, Redfish, Yellow Belly, Pettit, and Alturas lakes (including their inlet and outlet creeks).

Spawning and rearing habitats are considered to be all of the above-named lakes and creeks, even though at the time of the Critical Habitat Notice, spawning only still occurred in Redfish Lake. These habitats are in Custer and Blaine counties in Idaho. However, the habitat area for the salmon is at high elevation, above the agriculture zone, and in protected areas of a National Wilderness area and National Forest. Diflubenzuron cannot be used on such a site, and therefore there will be no exposure in the spawning and rearing habitat. There is a probability that this salmon ESU could be exposed to diflubenzuron in the lower and larger river reaches during its juvenile or adult migration.

Table 45 shows the acreage of potential sites in Idaho counties where this ESU reproduces. The critical spawning zones demonstrate, at the maximum allowable application levels, the potential for 5,839,504 lbs a.i. can be used in forest applications.

Table 46 shows the acreage of crops where diflubenzuron can be used in Oregon and Washington counties along the migratory corridor for this ESU.

Table 45. Idaho counties where there is spawning and rearing habitat for the Snake River sockeye salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
ID	Blaine	Forest	796038	1592076
ID	Custer	Forest	2123718	4247428

Table 46. Oregon and Washington counties that are in the migratory corridors for the Snake River sockeye salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Clatsop			None
OR	Columbia	Pears	12	12
OR	Columbia	Walnuts	11	17
OR	Columbia	Outdr Plants	1860	465
OR	Columbia	Christmas Trees	177	12
OR	Columbia	Cherries	7	3
OR	Gilliam			None
OR	Hood River	Pears	11788	11788
OR	Hood River	Cherries	1081	405
OR	Hood River	Outdr Plants	245	61
OR	Hood River	Forest	209385	418778
OR	Morrow	Forest	143305	286618
OR	Multnomah	Cherries	8	3
OR	Multnomah	Christmas Trees	166	12
OR	Multnomah	Pears	25	25
OR	Multnomah	Walnuts	2	3
OR	Multnomah	Outdr Plants	2936	734
OR	Multnomah	Forest	77826	155652
OR	Sherman			None
OR	Umatilla	Cherries	349	131
OR	Umatilla	Pears	4	4
OR	Umatilla	Outdr Plants	396	99
OR	Umatilla	Forest	401714	803428
OR	Wallowa	Forest	1149951	2299902
OR	Wasco	Cherries	7352	2757
OR	Wasco	Pears	385	385

OR	Wasco	Outdr Plants	144	36
OR	Wasco	Forest	176128	352256
WA	Asotin	Forest	53797	107594
WA	Asotin	Cherries	17	6
WA	Asotin	Pears	6	6
WA	Benton	Walnuts	41	33
WA	Benton	Cherries	3219	1207
WA	Benton	Outdr Plants	216	389
WA	Benton	Pears	472	472
WA	Clark	Forest	1183	2366
WA	Clark	Christmas Trees	358	25
WA	Columbia	Forest	53797	107594
WA	Franklin	Pears	156	156
WA	Franklin	Walnuts	5	8
WA	Franklin	Outdr Plants	6454	11617
WA	Franklin	Cherries	2165	812
WA	Franklin	Mushrooms	7	140
WA	Garfield	Forest	476495	952990
WA	Klickitat	Forest	34537	69074
WA	Klickitat	Cherries	457	171
WA	Klickitat	Pears	331	331
WA	Walla Walla	Forest	2433	4866
WA	Walla Walla	Cherries	280	105
WA	Walla Walla	Outdr Plants	2714	4885
WA	Pacific	Christmas Trees	17	1
WA	Pacific	Outdr Plants	179	322
WA	Skamania	Pears	477	477

WA	Skamania	Forest	858066	1716132
WA	Skamania	Nuts (in shell)	4	3
WA	Whitman	Christmas Trees	4	<1
WA	Whitman	Outdr Plants	980	245
WA	Whitman	Pears	2	2

The Snake River Sockeye salmon ESU courses through major agricultural zones and large forest areas. Although not currently practiced, use of diflubenzuron at label rates on these large areas could have significant indirect effects on the species of concern. Future use appears unlikely based on data from local agencies. Diflubenzuron may affect, but is not likely to adversely affect, the listed species.

4. Specific Conclusions for California and Pacific Northwest Steelhead and Salmon ESUs

The evaluation of diflubenzuron by EFED indicated that there were no exceedences of the LOC's for the T&E fish species examined for this report. The LOC for acute risk was exceeded for aquatic invertebrates for all sites, an expected result for this arthropod toxin (growth regulator). This observation suggests some potential for indirect effects on the fish species through a partial loss of the food supply. The young salmon and steelhead do not, however, actively feed until movement from the redds is initiated, instead using stored yolk sac material. After active movement begins, it is likely that the dilution and degradation pattern of diflubenzuron will rapidly eliminate any potential threat to the macroinvertebrate food source.

In addition to being low in toxicity to fish, diflubenzuron degrades quickly and is not mobile, suggesting that any contamination of the water used by endangered salmon and steelhead will quickly dissipate. Diflubenzuron use within these ESU's is also limited by the rather select list of registered sites and the exclusion of most major crops grown within the area, such as wheat, corn, and barley. Particularly in the Pacific Northwest, these major crops occupy very large proportions of the land used for agriculture. It is also noted that diflubenzuron is an important element in public health (for mosquito abatement) and a major element in gypsy moth control programs (not a significant concern in western states as yet).

The current labels, however, include use in forested areas. Because this ecological zone covers much of the Pacific Northwest use of the product for large scale forestry application requires a determination that it may affect the species of concern through a reduction in the food supply. This reduction, and the presumed slower rate of growth, would likely increase predation, most likely from larger hatchery salmonids, and impact the listed species. For this reason the chemical is listed, in many areas, as having the potential to affect the species of concern but not likely to adversely affect it because current practice suggests that this is an unlikely scenario.

Table 47: Summary of Findings for California and Pacific Northwest Salmon and Steelhead ESUs

Species	ESU	Finding
Steelhead	Southern California	No Effect
Steelhead	South-Central California Coast	No Effect
Steelhead	Central California Coast	No Effect
Steelhead	Central Valley California	No Effect
Steelhead	Northern California	No Effect
Steelhead	Upper Columbia River	May affect, but not likely to adversely affect
Steelhead	Snake River Basin	May affect, but not likely to adversely affect
Steelhead	Upper Willamette River	May affect, but not likely to adversely affect
Steelhead	Upper Willamette River	May affect, but not likely to adversely affect
Steelhead	Lower Columbia River	May affect, but unlikely to adversely affect
Steelhead	Middle Columbia River	May affect, but not likely to adversely affect
Chinook Salmon	Sacramento River winter run	No Effect
Chinook Salmon	Snake River fall run	May affect, but not likely to adversely affect
Chinook Salmon	Snake River spring/summer run	May affect, but not likely to adversely affect
Chinook Salmon	Central Valley spring run	No Effect
Chinook Salmon	California Coastal	No Effect
Chinook Salmon	Puget Sound	May affect, but not likely to adversely affect
Chinook Salmon	Lower Columbia	May affect, but not likely to adversely affect

Chinook Salmon	Upper Willamette	May affect, but not likely to adversely affect
Chinook Salmon	Upper Columbia	May affect, but not likely to adversely affect
Coho Salmon	Central California Coast	No Effect
Coho Salmon	Southern Oregon/Northern California	May affect, but not likely to adversely affect
Coho Salmon	Oregon Coast	May affect, but not likely to adversely affect
Chum Salmon	Hood Canal summer run	May affect, but not likely to adversely affect
Chum Salmon	Columbia River	May affect, but not likely to adversely affect
Sockeye Salmon	Ozette Lake	No Effect
Sockeye Salmon	Snake River	May affect, but not likely to adversely affect

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Attachment 1
Reregistration Eligibility Decision for Diflubenzuron

Attachment 2
EPA Quantitative Use Analysis
Diflubenzuron

Attachment 3
Sample Labels
Diflubenzuron

Attachment 4
USGS Usage Map for Diflubenzuron